MODELS
TOUCAN 861

ISO 9001 BSI REGISTERED
Cert. N° FM 40826

SERVICE MANUAL

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Updated : 04-2006

MA0280-01
English - Service

CE Models
English Version

Toucan 861

N° _____

MA0280-01

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CHAPTER 1

INTRODUCTION

FOREWORD

This handbook has been compiled to assist you in properly operating and maintaining your Aerial Work Platform Model **Toucan861**.

It contains detailed descriptions of control and maintenance procedures to be performed by the user, including their periodicity.

It also contains technical information and procedures enabling a qualified personnel to detect possible failures and perform the necessary adjustments or repairs.

Verify that this manual corresponds to the work platform model you will be maintaining.

Before any maintenance on the work platform, you must read and understand the operating and safety procedures described in the corresponding Operator's and Safety Handbook.

To perform the maintenance procedures described in this manual, a basic knowledge in mechanics, hydraulics and electricy is necessary.

Certains procedures require specific competences, tooling, and handling equipment. We therefore recommend that these repair and maintenance procedures are carried out only by authorized and qualified personnel.

Constant improvement make it necessary that JLG reserve the right to make specification and equipment changes without notice.

If you have any questions on operating, maintenance procedures, contact your authorized JLG distributor.

Prior to any maintenance or repair procedure, it is necessary to :

- Read and understand the operating and safety procedures in this manual and in the Operator's and Safety Handbook.
- Read each procedure in this manual to the end before applying it to the machine.
- Ensure you have all the appropriate tools and equipment necessary for the repair or maintenance to be performed.
- Have all replacement parts ready to perform the repair.
- Work in a clean, spacious and well lit area.
- Wear all protection equipment (glasses, gloves,...) appropriate for the operation to be performed.
- Place the work platform in the following configuration (unless otherwise specified) :

- on a firm, clean and horizontal floor.
- wheels choked in both directions.
- in retracted position.
- the contact key positioned to "O" and removed.
- battery disconnected.
- charger disconnected.
- power socket on the platform (optional equipment) disconnected.
- each control panel must be tagged out.

DANGER

Failure to respect instructions and safety instructions described in this manual and in Operator's and Safety Handbook could result in death or serious injuries.

Safety instructions contained in the operator's and safety handbook apply also during operating controls, maintenance and repairs. They do not replace national, state or local work regulations, industry standards or employer's work rules.

DANGER

Do not perform any operating control, maintenance or repair :

1- If you are not qualified and trained to the maintenance of THIS particular work platform.
2- If you have not read and understood the operating and safety procedures described in this manual and in the Operator's and Safety Handbook for THIS particular work platform.
3- If you are not familiar with regulations and standards governing aerial work platforms and their operation.
4- If you do not have necessary tools and equipments.

Your safety and that of persons working on and around the work platform must be your prime concern. All safety components on the work platform must be maintained in perfect working order.

You will find in this manual blocks or paragraphes containing the following mentions:
DANGER, CAUTION and NOTE. These mentions are defined as follows :

DANGER

A DANGER is used to emphasize that if an operation, procedure or practice is not followed exactly, death or serious injury to personnel may result.

CAUTION

A CAUTION is used to emphasize that if an operation, procedure, or practice is not followed exactly, equipment damage may result.

NOTE

A note is used to emphasize an important procedure or condition.

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CORRECTIVE ACTION REQUEST

The following form is for the use of the Distributor, Customer, Mechanic, and all other person who use this manual and recognize beneficial ways to improve its purpose as a worthy reference. SMCAR's are to be made in regards to, but not limited to : Safety, Operation Correctness, and Technical Content. All SMCAR's will be reviewed by the responsible Department at JLG. Approved SMCAR's will be distributed in a Service Bulletin immediately and then incorporated in the next scheduled change to the manual. An answer to the SMCAR's, approved or disapproved, will be sent directly to the one submitting the SMCAR.

Date _____
Customer name _____
Name/First name _____
Address _____
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Telephone _____

Service Manual
Affected _____

Page(s) Affected _____

Reason for submitting SMCAR (use additinal paper or back if necessary) _____

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Signature (optional)

Address SMCAR's to :

JLG France SAS
Product Support
Z.I. de Fauillet, BP 20
47400 Tonneins FRANCE

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CHAPTER 2

WORK PLATFORM CHARACTERISTICS

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2.1 Description

The work platform consists of a self propelled all welded steel frame, a telescopic mast mounted on a turntable and a pendular jib. The platform is mounted at the end of the jib.

The drive function is accomplished by two hydraulic motors that propel the rear axle. Both these motors integrate the parking brake operating through lack of pressure. Steering is accomplished by means of a hydraulic cylinder.

The hydraulic power unit supplying the functions of the work platform is located on the base of the turntable on the right hand side of the telescopic mast.

The turntable rotation movement is accomplished through a worm gear reducer located at the base of the turntable.

The movements of the telescopic mast and pendular jib are accomplished by means of hydraulic cylinders.

The work platform movements are controlled from the control panels through hydraulic control valves controlled electrically located on the right hand side of the telescopic mast.

For hydraulic control valve with manual control, the main control valve (located in the platform) is supplied by the hydraulic power unit. The emergency and breakdown control valve, located under the oil tank (left hand side of the mast) is supplied by the hand pump.

The energy for the control and power circuits of the work platform is supplied by a 24 Vdc battery.

2.2 Characteristics - Dimensions - Performances

DIMENSIONS (LOWERED)	Standard platform	Large platform
Length	2,68 m	2,99
Width	0,99 m	
Height	1,99 m	
Weight	2980 kg	
Ground clearance	0,10 m	

ACCESSIBILITY	Standard platform	Large platform
Min. floor height	0,40 m	
Max. floor height	6,72 m	
Max. working height	8,72 m	
Max outreach (centerline)	2,64 m	2,96 m
Max working outreach (centerline)	3,14 m	3,46 m
Floor height at max. outreach	5,42 m	
Working height at max. outreach	7,42 m	
Slewing	180°	
Inner steering radius	1,02 m	
Outer steering radius	2,40 m	

PLATFORM	Standard platform	Large platform
Length	0,70 m	1,01 m
Width	0,90 m	
Rated load	220 kg	200 kg

HYDRAULIC CIRCUIT	
Oil tank capacity	20 l
Hydraulic circuit capacity (tank included)	25 l
Hydraulic pump cylindric capacity	5,5 cm^3/t

FILTRATION	
Pressure	10 µm absolute
Return	20 µm absolute

PRESSURES	Overall	Steering	Mast raising	Jib raising	Slewing
Hydraulic circuit max. pressure (MPa)	23	12	16	14	8

ELECTRICAL COMPONENTS	
Power of power unit motor	3 kW - 24 Vdc

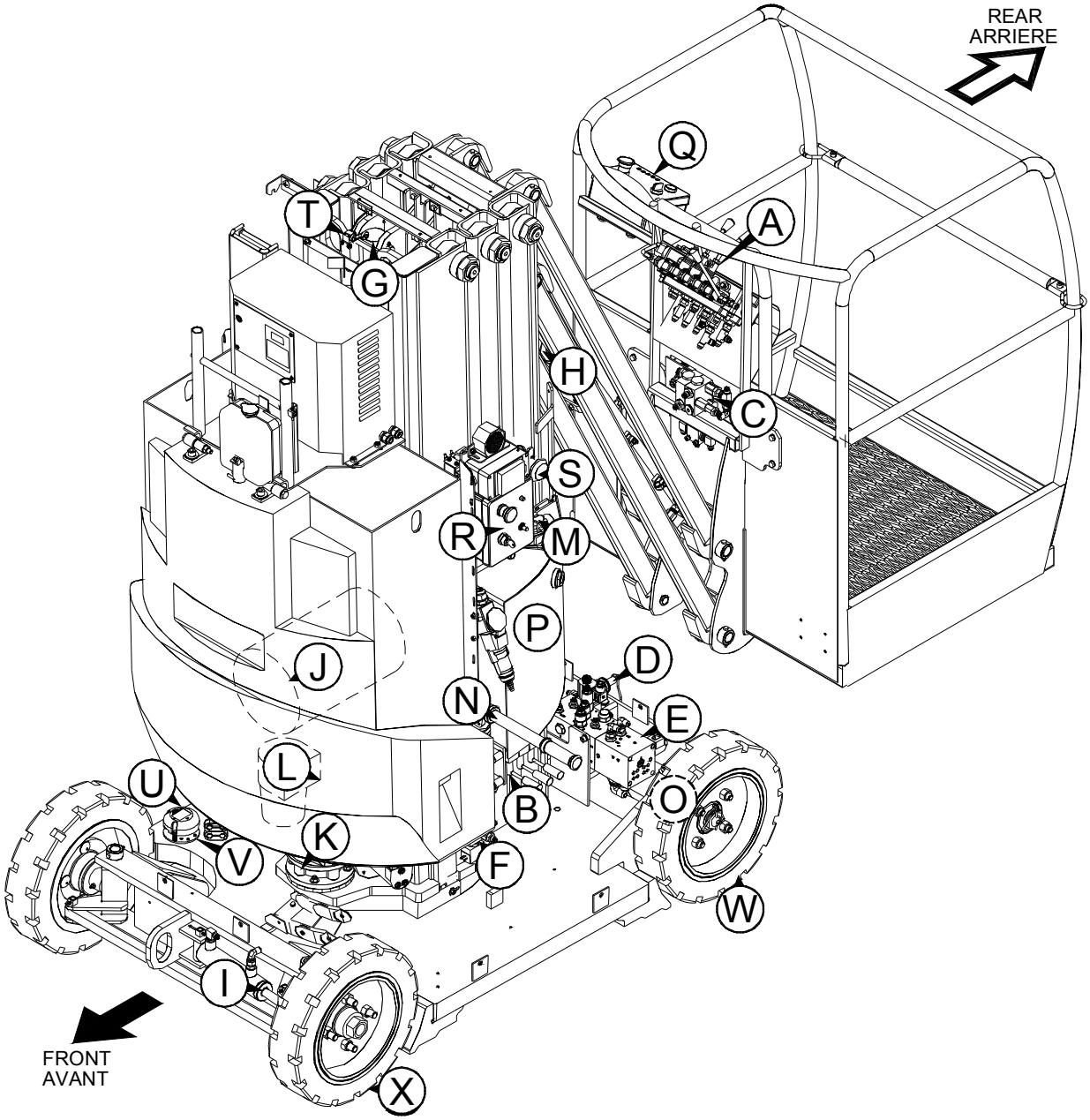
DRIVE SPEEDS (*)	
1st gear (low speed)	0,5 to 0,75 km/h ie 24 to 36s over 5m
2nd gear (climbing speed)	1,65 to 2,1 km/h ie 17 to 22s over 5m
3rd gear (high speed)	3,2 to 4,1 km/h ie 13 to 17s over 10m

MOVEMENT SPEEDS (**)	
Mast elevation time	20 to 26 s
Mast lowering time	27 to 35 s
Jib elevation time	15 to 20 s
Jib lowering time	19 to 23 s
Slewing time (from stop to stop)	25 to 33 s

(*) speeds measured on horizontal ground with one person in the platform (approximately 80 kg).
(**) times measured with the maximum rated load in the platform (200 kg), the movements were performed from the control panel in the platform.

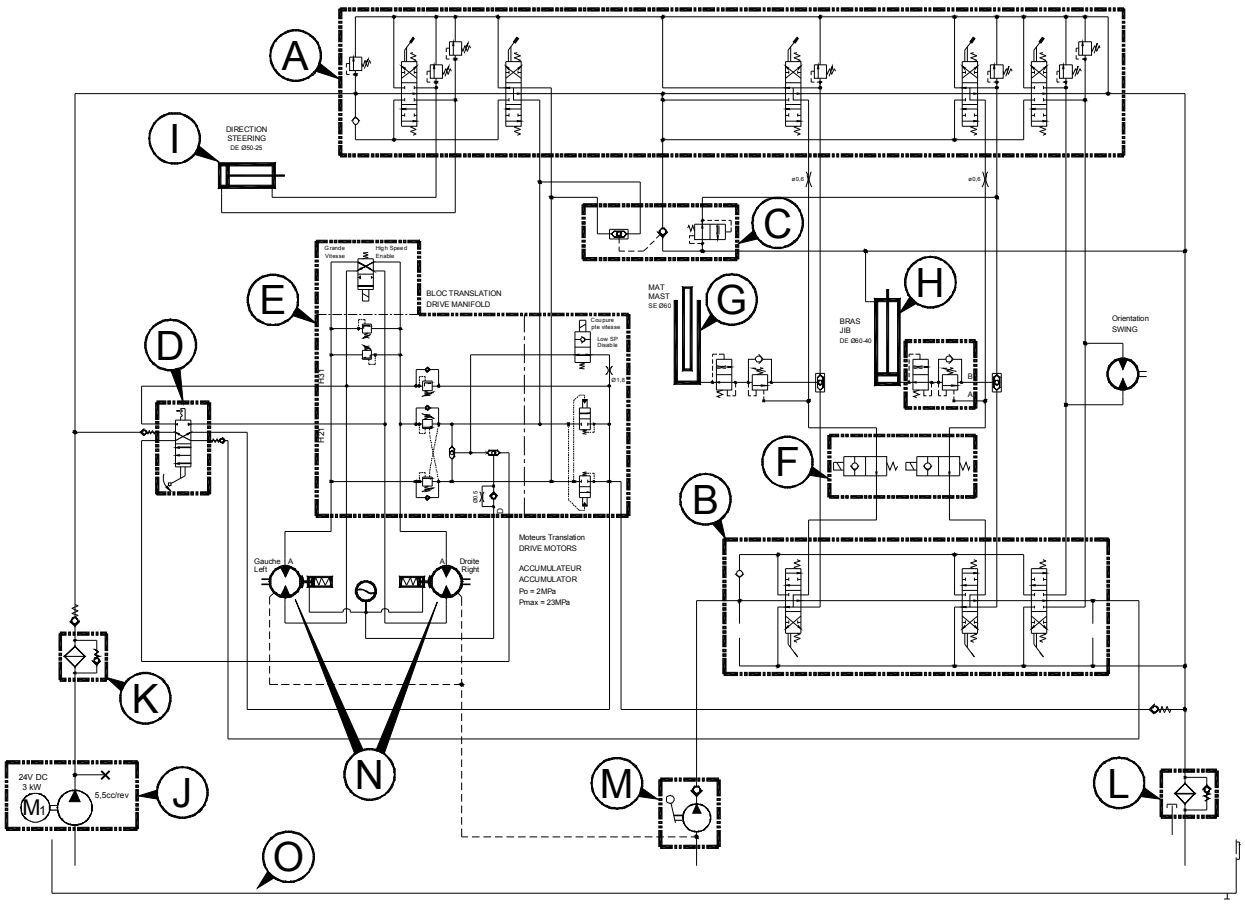
Constant product improvement make it necessary that JLG reserve the right to make specification and equipment changes without notice.

2.3 Identification of components



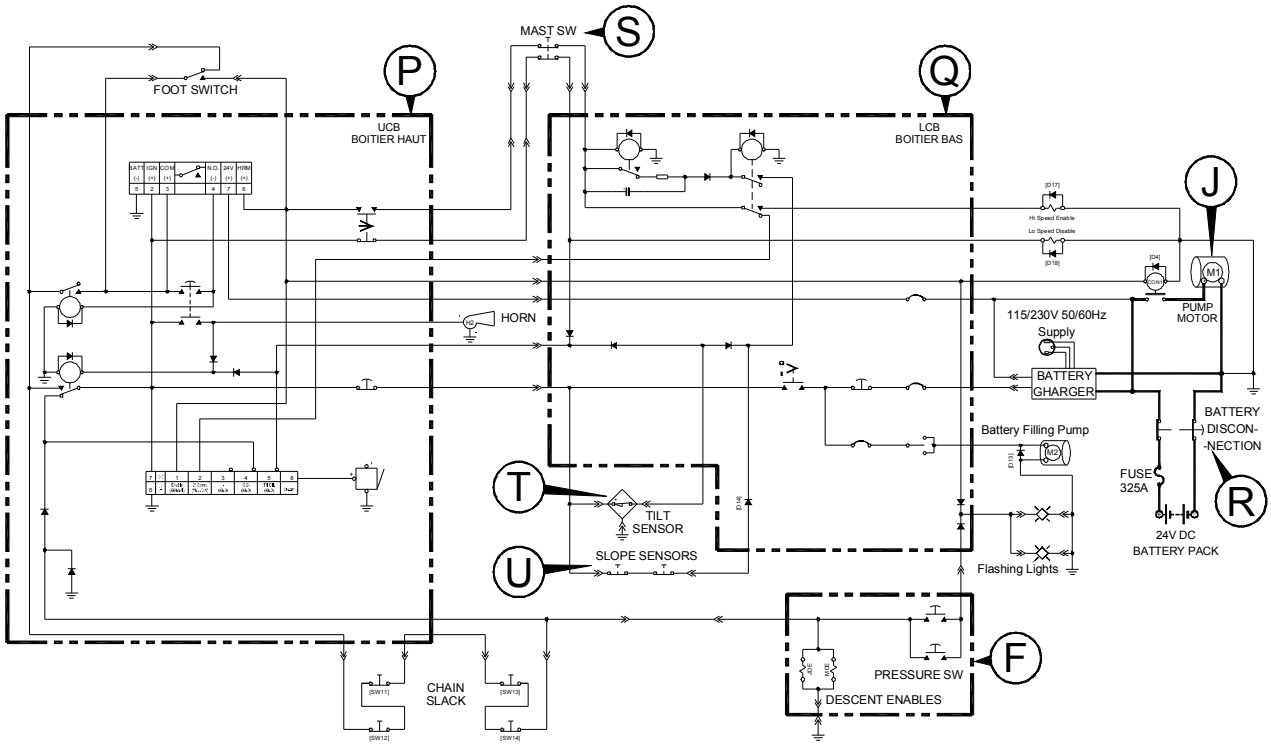
Mark	Description	See §	Mark	Description	See §
A	Upper control valve	4-8-1 / 5-8	L	Return filter	OP
B	Lower control valve	5-9	M	Hand pump	5-5
C	Auxillary upper manifold	5-12	N	Wheel motor	5-7
D	Release manifold	5-10	O	Tank	OP
E	Drive manifold	4-8-2 / 5-11	P	Upper electrical box	OP
F	Safety manifold	4-7 / 5-13-3	Q	Lower electrical box	OP
	Dump valve manifold		R	Circuit breaker	OP
G	Mast cylinder	5-13-1	S	Tilt sensor	3-2
H	Jib cylinder	5-13-2	T	Mast switch	4-3
I	Steering cylinder		U	Incline sensor	4-4
J	Power unit	5-6	V	Driving wheel	
K	Pressure filter	OP	W	Steering wheel	

See OP = see Operator's and safety handbook



Hydraulic schematic / Schéma hydraulique

Electrical schematic / Schéma electrique



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CHAPTER 3

BREAKDOWN

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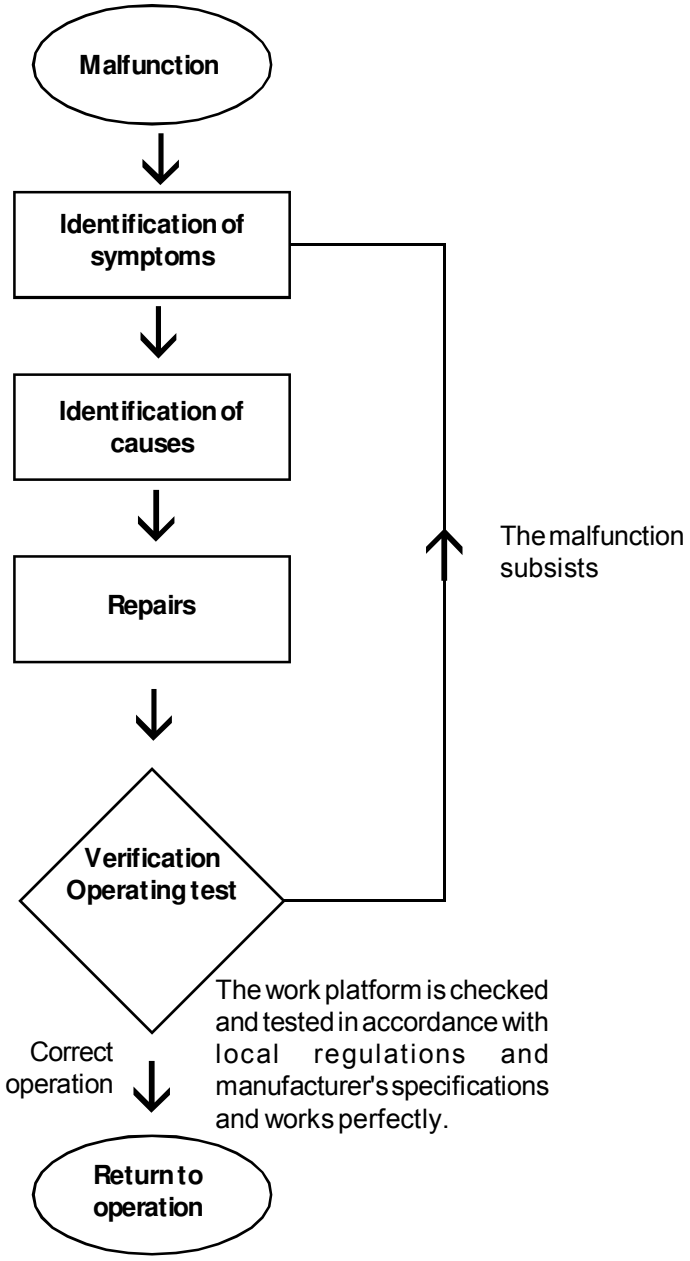
3.1 General procedure

General procedure to follow when performing a repair :



The safety of persons working on and around the work platform must be your prime concern. After repairs, the work platform can only return to service after a thorough functional check. All covers and protections must be installed.

3.2 Operating principles of safety features

Mast sensor (SW2)

Made of 2 normally closed (NC) contacts, it disables the 2nd and 3rd gears (slope and high speed) and enables the tilt sensor.
The contacts open as soon as the mast leaves its lowered position.

Tilt sensor

The sensor's output signal (+ battery) is cancelled when the machine is tilted above the maximum authorized value.
A tilt causes (if the mast has left its lowered position):

- A light and acoustic alarm to sound on the upper electrical box.
- all movements to be disabled.

The reset button must be depressed before the pedal is activated to restore the movements.

NOTE
The alarm remains activated as long as the machine is tilted above its authorised limit.

The tilt sensor supplies the incline system **(SW15)** and **(SW16)** through diode **(D10)** in order to reduce its sensitivity to bumps (due to its integrated temporisation).

Incline sensors (SW15) et (SW16)

Both sensors **(SW15)** and **(SW16)** are integrated to the tilt sensor, and work on the same principle, but limited however to a longitudinal axis (detection limited to front / rear detection).
Opening of one of these contacts is caused by an excessive pitch and disables the 3rd drive gear (high speed). It can be reactivated if the pitch has become acceptable again by resetting the system (release and depress the pedal again).
The relays **(K3)** and **(K4)** manage the information from the sensors **(SW15)** and **(SW16)** and ensure:

- a temporisation on start up (to absorb the acceleration at the start of the drive movement): **(K3).**
- memorisation of the sensors opening: **(K4).**

Suppression of 3rd gear availability is signalled by an orange light indicator on the platform control panel.

Slack chain sensors (SW11) (SW12) (SW13) and (SW14)

Made of normally closed (NC) contacts, they stop the mast and jib from lowering in case of a slack chain.

Battery discharge indicator

It is located in the upper electrical box.
All movements are disabled when the indicator reaches its cut-out threshhold.
The reset button, if activated BEFORE the pedal, enables the operator to get to the charging station.
The indicator cut-out is signalled by the alternate flashing of the last 2 red leds.

3.3 Troubleshooting

3.3.1 Batteries

Refer to troubleshooting in the Operator's manual

3.3.2 Connectors

- No continuity (<=> xV at input and 0V at output).
  Contact not in place, crimping faulty or broken wire.
  Remove, check the locking lances, repair and install.

- Significant difference of voltage between input and output.
  Oxydation of contact.
  Clean or replace the contact function of their degree of oxydation.
  Check the other connector contacts.
  Connector with seals:
  Check the seals, replace them in case of cracks or cuts.
  Connector without seal:
  Install with grease (i.e. silicon)

- Random contact.
  Check the problems of continuity and oxydation (See above).

3.3.3. Circuit breakers of control circuit

Main :

It is located on the lower control box panel.

Connected
circuit breaker

Disconnected
circuit breaker

Auxiliary :

They are located into the upper control box.
A slight click when the control button is depressed lets the operator know that the circuit breaker was in the "disconnected" state.

NOTE : As long as the control button is kept depressed, the circuit breaker is in the "disconnected" state. Ensure that nothing presses them when the box is being closed.

3.3.4 Fault diagnosis

Diag I :	No function.
Diad II :	Tilt alarm activated as soon as the mast leaves its lowered position.
Diag III :	Mast and jib lowering impossible from the platform controls.
Diag IV :	Movements at reduced and/or irregular speed.
Diag V :	Drive problems.
Diag VI :	Mast raising problems.
Diag VII :	Mast lowering problems.
Diag VIII :	Jib raising problems.
Diag IX :	Jib lowering problems.
Diag X :	Slewing problems.
Diag XI :	Steering problems.

Diag I

No function

Preliminary checks

Battery charged correctly.
Battery connections in good condition.
Fuse [F1] 325A not triggered.
Circuit breakers on "ON".
- [CB1] : 5A face LCB.
- [CB2] : 0,63A inside LCB.

Battery circuit breaker pulled out.
Emergency stop switches pulled out.
Key selector on "**I**" .
Speed selector on "  .
The machine is on flat and horizontal ground.

Depress the enable pedal

Nothing | **Led enable lit** | **Pump turns**

See page "Diag I-1"

Hourmeter condition

On | **Off**

See page "Diag I-2"

Discharge indicator condition

Green | **Off** | **Red**

See page "Diag I-3"

Tilt signaled

Yes | **Not**

Press on reset switch then on enable

Pump turns | **Pump does not turn**

See page "Diag I-4"

See page "Diag I-5"

Diag I-1

Depress the enable pedal

Nothing

See following page

Led enable lit

Pump turns

Hydraulic oil level. — Low → Fill.

correct

Check the coupling between the motor and the pump. — Broken → Replace.

correct

Contact JLG Product Support.

Condition Pump contactor

Does not stick

Measure the voltage at input of CR1 - contact n°4 - — < 24V → Check / repair the connection terminal block upper control box - wire # 10 - Check / repair link cable to the upper control box

⩾ 24V

Measure the voltage at terminal block in lower control box - wire # 10 - — < 24V → Check / repair connector CR1 -see § 3.3.2. Check / repair the link cable connector / terminal block. Check / repair the connection terminal block Lower control box - wire # 10 -

⩾ 24V

Measure the voltage at pump contactor terminal - CON 1. — < 24V → Check / repair the link cable Box / contactor. Check / repair the relay connections.

⩾ 24V

Replace the contactor.

Stick

Measure the voltage at input of contactor - power cable - — < 24V → Check the connections are tight and absence of oxydation on connections. Check the power cables.

⩾ 24V

Measure the voltage at output contactor - power cable - — < 24V → Replace the contacts.

⩾ 24V

Measure the voltage at motor terminals. — < 24V → Check the connections are tight and absence of oxydation on connections. Check the power cables.

⩾ 24V

Check the condition of the brushes (battery disconnected). — Worn → Replace the brushes.

Correct

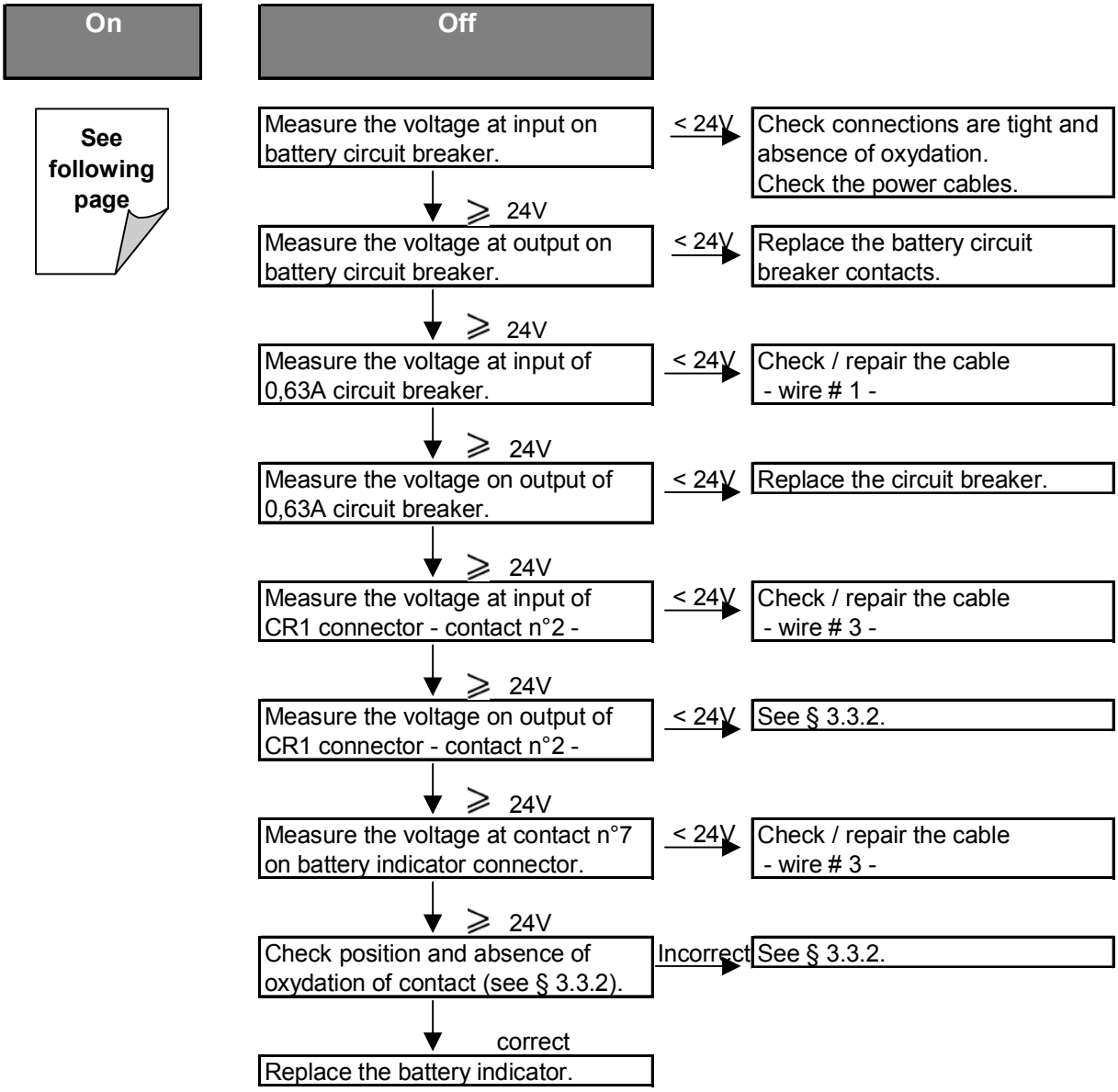
Disconnect the pump. Check for blockage. — Blocked → Replace the pump. See specific § for analysis.

Without blokage

Contact JLG Product Support.

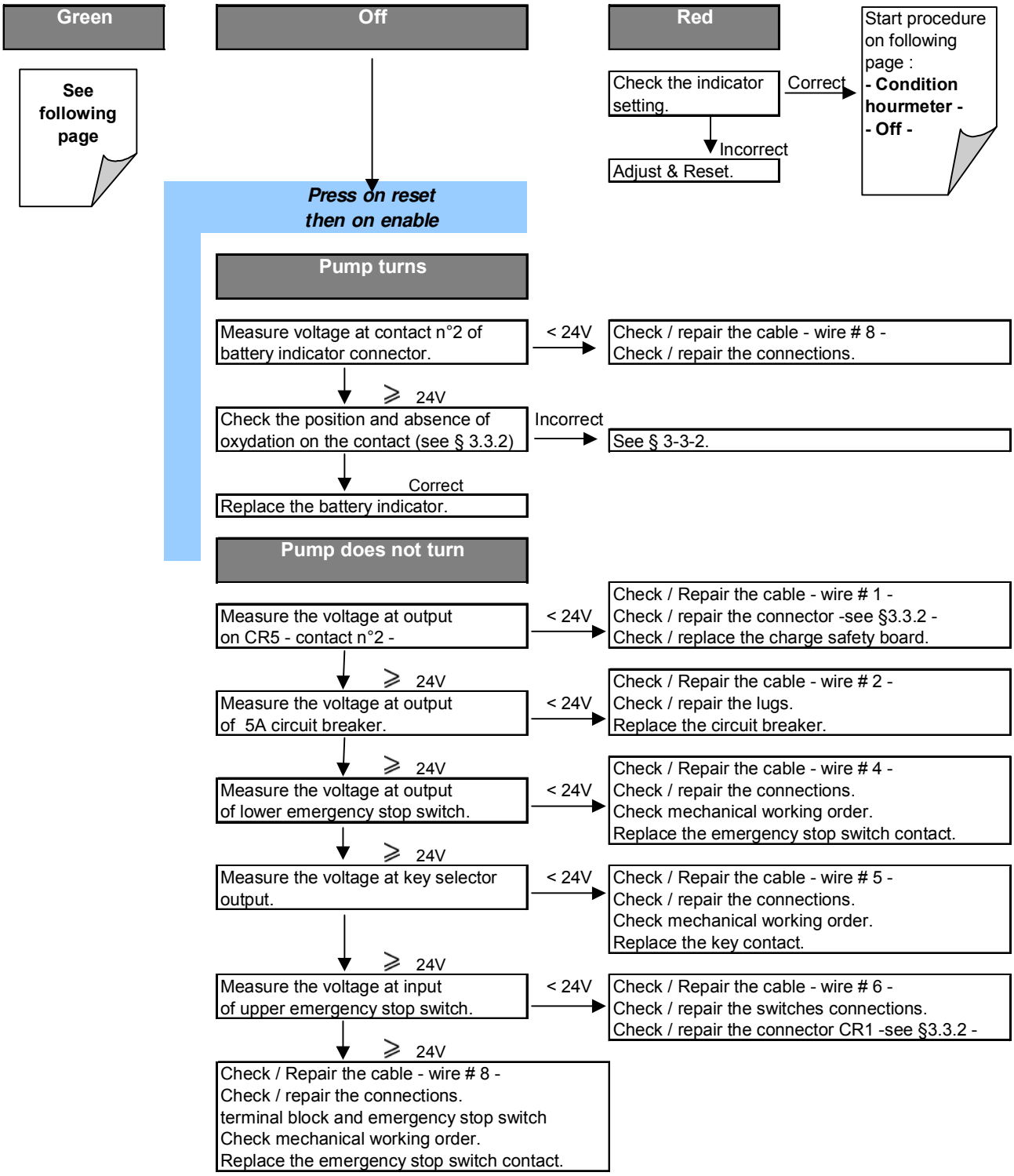
Diag I-2

Hourmeter condition



Diag I-3

Discharge indicator condition



Diag I-4

Tilt signalled

Yes

Measure voltage at output of CR1 - contact n°5 -

⩾ 24V

Check / repair the link cable to the UCB.
Check / repair the connection UCB terminal block - wire rep.29 -

< 24V

Check / repair the connection terminal LCB - wire rep.29 -
Check / repair the link cable connector / terminal block.
Check / repair the connector.
See § 3-3-2.

No

Press on reset switch
Then on enable

Pump turns

Measure voltage at contact n°3 on battery indicator connector.

< 24V → Check / repair cable rep.9 between terminal block and battery indicator.

⩾ 24V

Check the position and absence of oxydation of the contact (See § 3-3-2).

Incorrect → See § 3-3-2.

Correct

Measure voltage at contact n°4 on battery indicator connector.

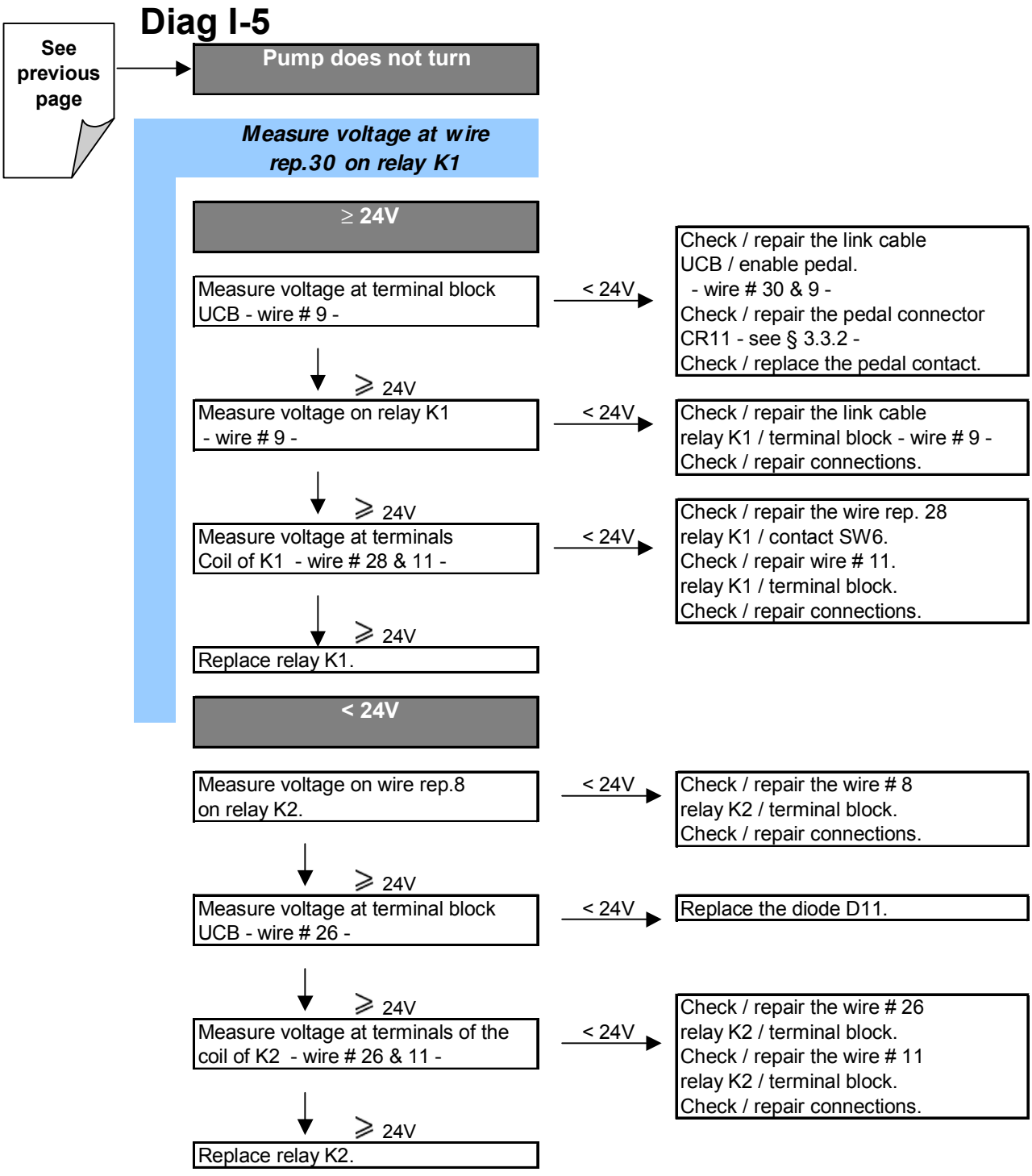
< 24V → Check / repair the contact -see 2 Or replace the battery indicator.

⩾ 24V

Check / repair the cable rep.28, the battery indicator and contact of SW6.
Check / repair the connections.

Pump does not turn

See folowing page


Diag I-5
See previous page
Pump does not turn
Measure voltage at wire rep.30 on relay K1
≥ 24V
Measure voltage at terminal block UCB - wire # 9 -
< 24V
Check / repair the link cable UCB / enable pedal. - wire # 30 & 9 - Check / repair the pedal connector CR11 - see § 3.3.2 - Check / replace the pedal contact.
⩾ 24V
Measure voltage on relay K1 - wire # 9 -
< 24V
Check / repair the link cable relay K1 / terminal block - wire # 9 - Check / repair connections.
⩾ 24V
Measure voltage at terminals Coil of K1 - wire # 28 & 11 -
< 24V
Check / repair the wire rep. 28 relay K1 / contact SW6. Check / repair wire # 11. relay K1 / terminal block. Check / repair connections.
⩾ 24V
Replace relay K1.
< 24V
Measure voltage on wire rep.8 on relay K2.
< 24V
Check / repair the wire # 8 relay K2 / terminal block. Check / repair connections.
⩾ 24V
Measure voltage at terminal block UCB - wire # 26 -
< 24V
Replace the diode D11.
⩾ 24V
Measure voltage at terminals of the coil of K2 - wire # 26 & 11 -
< 24V
Check / repair the wire # 26 relay K2 / terminal block. Check / repair the wire # 11 relay K2 / terminal block. Check / repair connections.
⩾ 24V
Replace relay K2.

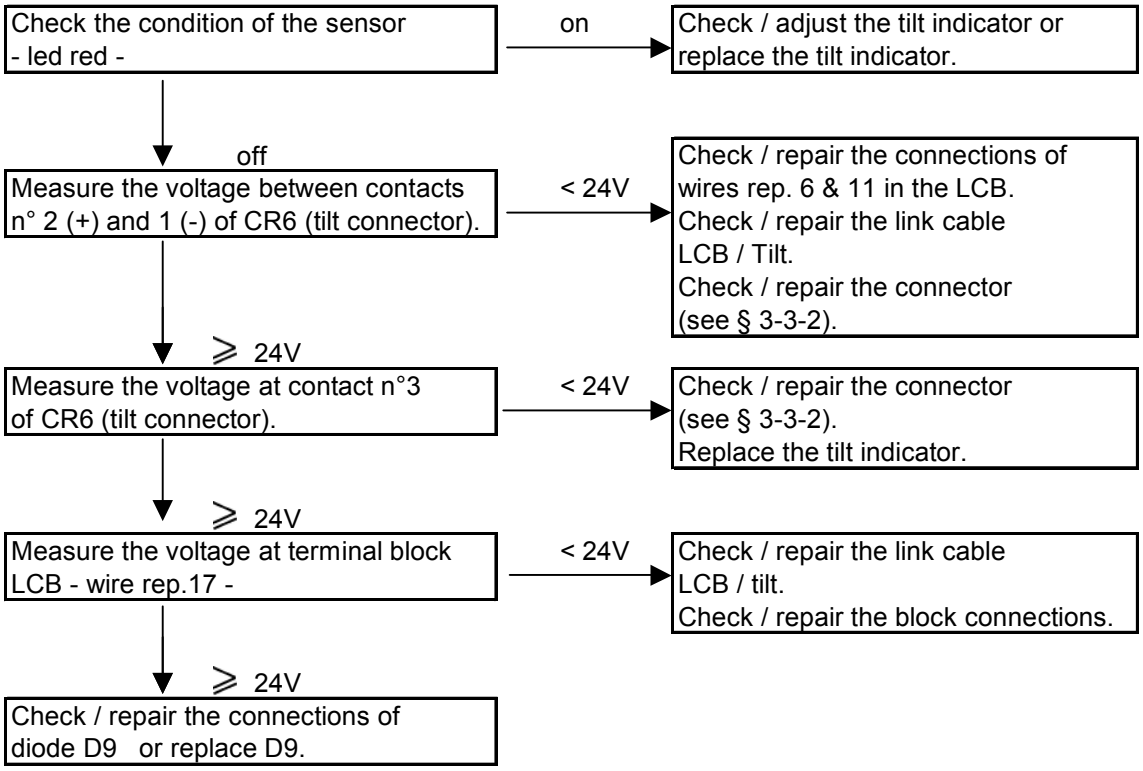
Diag II

Tilt alarm activated as soon as the mast leaves its lowered position

All functions are stopped

Preliminary checks

The machine works normally in lowered position.
Battery charged correctly.
Battery connections in good condition.
The machine is on flat and horizontal ground.



Diag III

Mast and jib lowering impossible from the platform controls
(if one descent only is affected refer to Diag VII or Diag IX)

Preliminary verifications :

All other functions are operational.
The machine is on flat and horizontal ground.
No chain is broken.
No chain is slack.

Check the condition of the slack chain default led on UCB

Lit

Measure the voltage at contact n°1 on CR10 (chain slack connector towards UCB).
- < 24V → Check / repair the connection of wire rep. 30 in the UCB. Check / repair the link cable UCB / CR10. Check / repair the connector - see § 3.3.2 -
- ⩾ 24V ↓

Measure the voltage at contact n°2 on CR10 (chain slack connector towards UCB).
- < 24V → Check / repair the link cable CR10 / sensors and inter-sensors. Check / repair the sensor connections. Check / replace the sensor contacts. Check / repair the connector - see § 3.3.2 - Check / repair the assembly of sensors and actuators.
- ⩾ 24V ↓

Measure the voltage at terminal block UCB -wire rep.19-
- < 24V → Check / repair the link cable UCB / CR10. Check / repair the connections on block
- ⩾ 24V ↓

Measure the voltage at contact n°1 on CR4 (connect. Slack chain LCB).
- < 24V → Check / repair the link cable UCB / LCB. Check / repair the connector - see § 3.3.2 -
- ⩾ 24V ↓

Measure the voltage at contact n°2 on CR4 (chain slack connector towards UCB).
- < 24V → Check / repair the link cable CR10 / sensors and inter-sensors. Check / repair the sensor connections. Check / replace the sensor contacts. Check / repair the connector - see § 3.3.2 - Check / repair the assembly of sensors and actuators.
- ⩾ 24V ↓

Check / repair the connection wire # 21 in the loom or between CR4 and this connection.

Off

Measure voltage at contact n°1 of CR3 (connector of mast 1 loom).
- < 24V → Check / repair the looms PC0217 & PC0191. Check / repair the connectors CR1 and CR3 - see § 3.3.2 -
- ⩾ 24V ↓

Measure voltage at the terminals of one of the coils for lowering autorisation.
- < 24V → Check / repair the link cable coils / LCB. Check / repair the connectors CR1 and CR3 - see § 3.3.2 -
- ⩾ 24V ↓

See JLG Product Support.

Diag IV

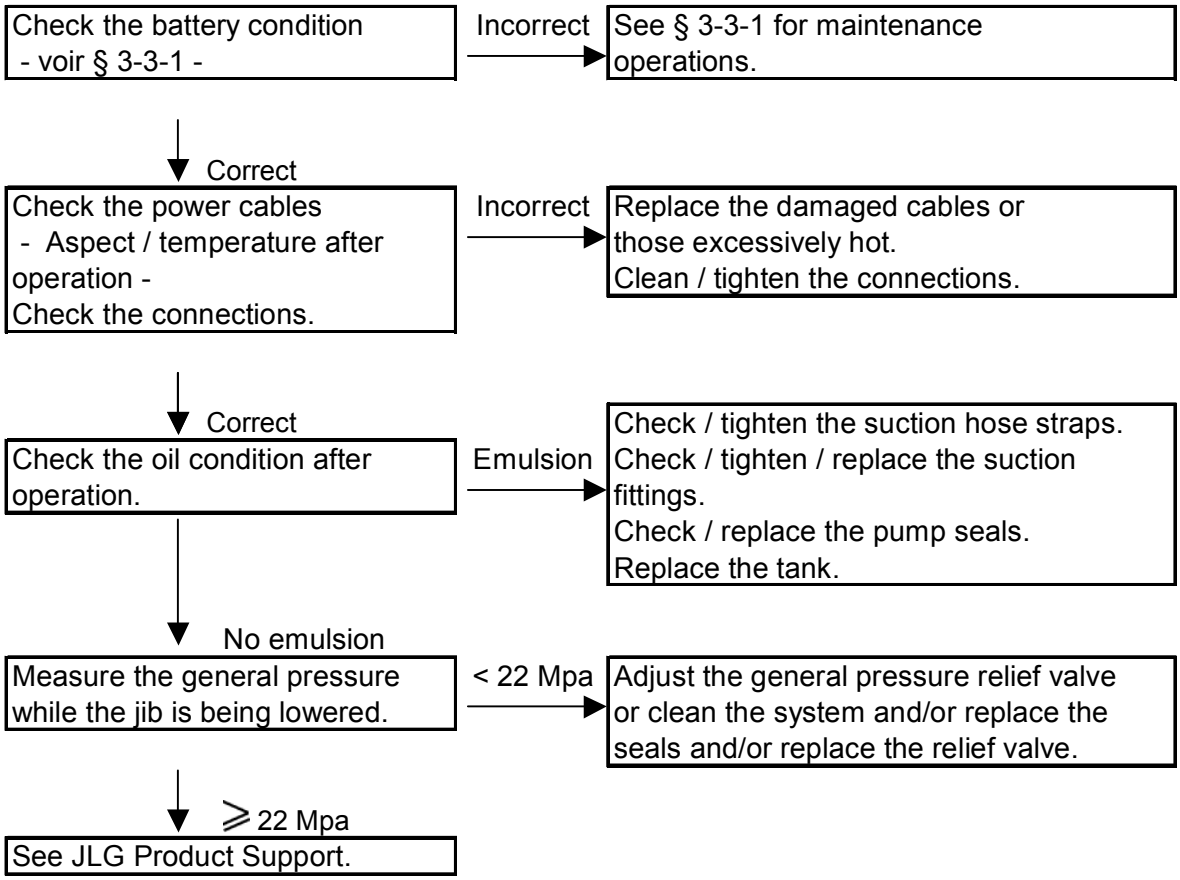
Movements at reduced and/or irregular speed.

Preliminary checks :

Battery charged correctly.

Battery connections in good condition.

The machine is on flat and horizontal ground.



Diag V

Drive problems

Preliminary checks :

This movement is the only one affected.
No external leak.
Battery charged correctly.
Battery connections in good condition.
The mast is lowered.
The machine is on flat and horizontal ground.

Drive

none

See page "Diag V-1"

3° ≈ 2° = 1° gear

See page "Diag V-1"

No 3rd gear or 3rd gear does not hold

State of indicator for switching to 2nd gear (during drive).

Off

See page "Diag V-2"

Lit

See page "Diag V-3"

Diag V-1

No drive

Measure the pressure on Port D "drive manifold"

- P ⩾ 25 b → Motor brakes stuck and/or not functionning. Remove / repair or Contact JLG Product Support.
- P < 25 b → Important internal leak in the drive manifold, Contact JLG Product Support.

3rd gear ≈ 2nd gear = 1st gear

Measure the voltage at coil terminals ''Low speed disable"

≥ 24V

Measure the impedance of the coil - disconnected -

- Other → Change the coil.
- 18 - 25 Ω → Check the solenoid valve (operation).
  - Incorrect → Clean and/or replace the valve.
  - Correct → Contact JLG Product Support.

< 24V

Measure the voltage at wire # 8 on the speed selector.

- < 24V → Check / repair wire # 8 between Terminal block / reset button & reset / speed selector. Check / repair the connections.
- ⩾ 24V → Measure the voltage at wire # 13 on the speed selector.
  - < 24V → Check / repair the connections of the speed selector. Check the selector good working condition. Check / replace the NC contact.
  - ⩾ 24V → Measure the voltage at contact n°8 on CR1 - female connector side -
    - < 24V → Check / repair the link cable to the UCB. Check / repair CR1 - see § 3.3.2 -
    - ⩾ 24V → Measure the voltage at contact n°4 on CR2 - female connector side -
      - < 24V → Check / repair the connector CR2 : Contacts 3 & 4 - see § 3.3.2 - Check / repair the loom PC0191 : link CR1 - CR2. Check / repair the link cable to the mast sensor. Check / repair / replace the mast sensor (mechanical - Contact - Connections).
      - ⩾ 24V → Measure the voltage at terminal block LCB - wire n°15 -
        - < 24V → Check / repair the loom PC0191 .
        - ⩾ 24V → Check / repair the link cable LCB / chassis : Wires # 11 & 15 / loom PC0194 Check / repair the connections LCB terminal block - wires # 11 & 15 -

Diag V-2

No 3rd gear or 3rd gear does not hold

Check the state of indicator for switching to 2nd gear - during drive -

Off → **See following page**

Lit as soon as enable is depressed

Measure the voltage at wire # 34 on LCB terminal block WHEN depressing the enable switch.
- 0V → Check / replace the condenser C1. Check / repair the connections on C1.
- ⩾ 24V then decreases

Measure the voltage at wire # 35 on relay K4.
- < 24V → Check / replace diode D2. Check / repair wire # 35 between terminal block and relay. Check / repair the connections.
- ⩾ 24V

Check / repair the connections of the coil on relay K4. Check / replace relay K4.

Lights up during operation

- Measures of continuity : emergency stop switches depressed -

Check continuity / connections wire # 36 between term. block / relay K4.
- Incorrect → Repair wire / connections.
- Correct

Check the continuity of contact # 35 & 36 relay K4 supplied.
- Incorrect → Change relay K4.
- Correct

Check continuity / connections of diodes D10 & D14.
- Incorrect → Replace diode(s) or Repair connections.
- Correct

Check continuity wire # 6 of PC0194 between contact key and CR7. Check continuity wire # 37 / PC0194 between LCB term. block and CR7.
- Incorrect → Repair the link cable PC0194 - LCB - chassis - Check / repair CR7 -see § 3.3.2-
- Correct

Measure the voltage at wire # 37 on CR7(2)
- < 20V → Replace tilt sensor
- ⩾ 20V

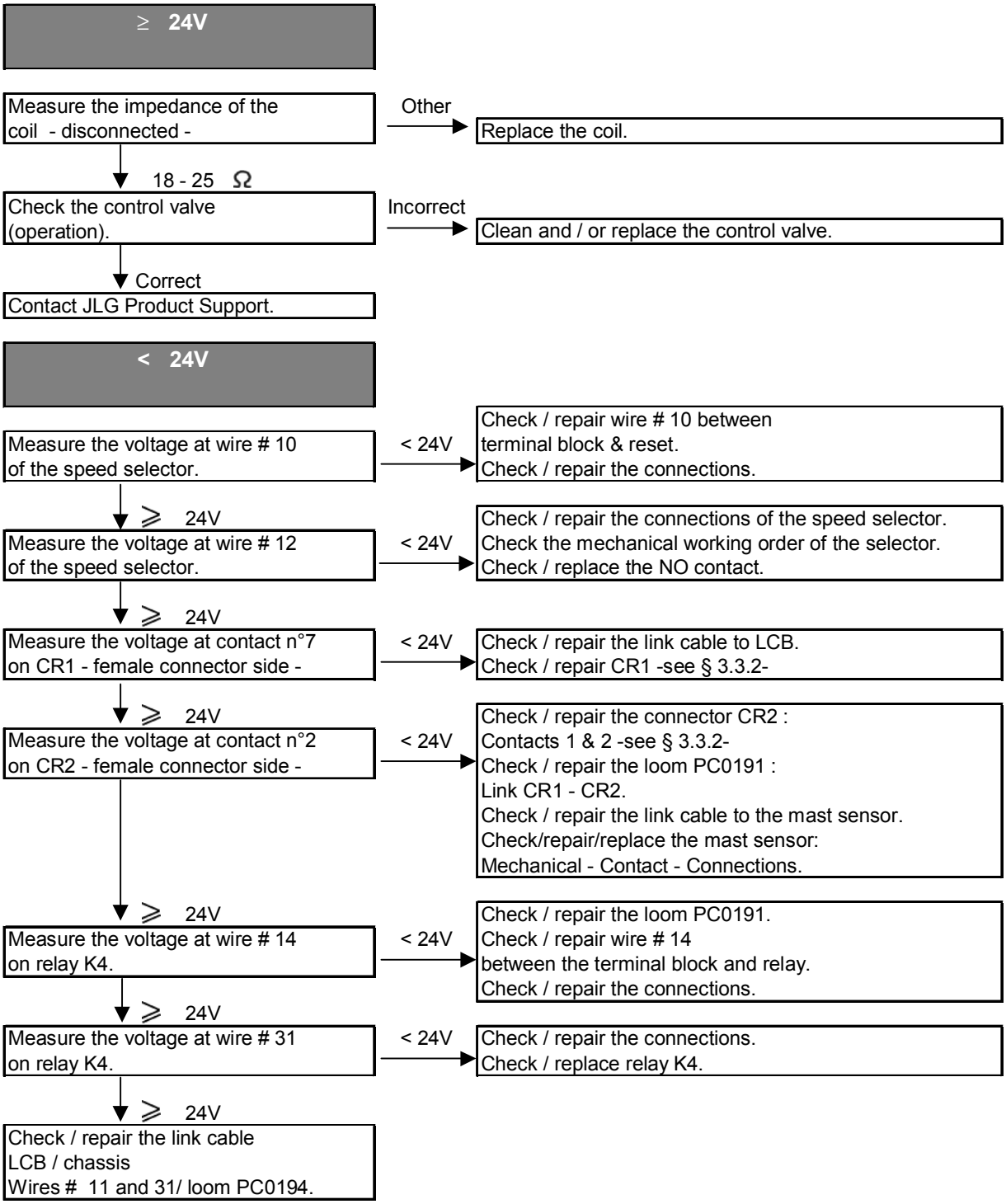
Contact JLG Product Support.

Diag V-3

No 3rd gear or 3rd gear does not hold

All voltage are to be measured with enable active

Measure the voltage at the coil terminals '' High speed enable ''

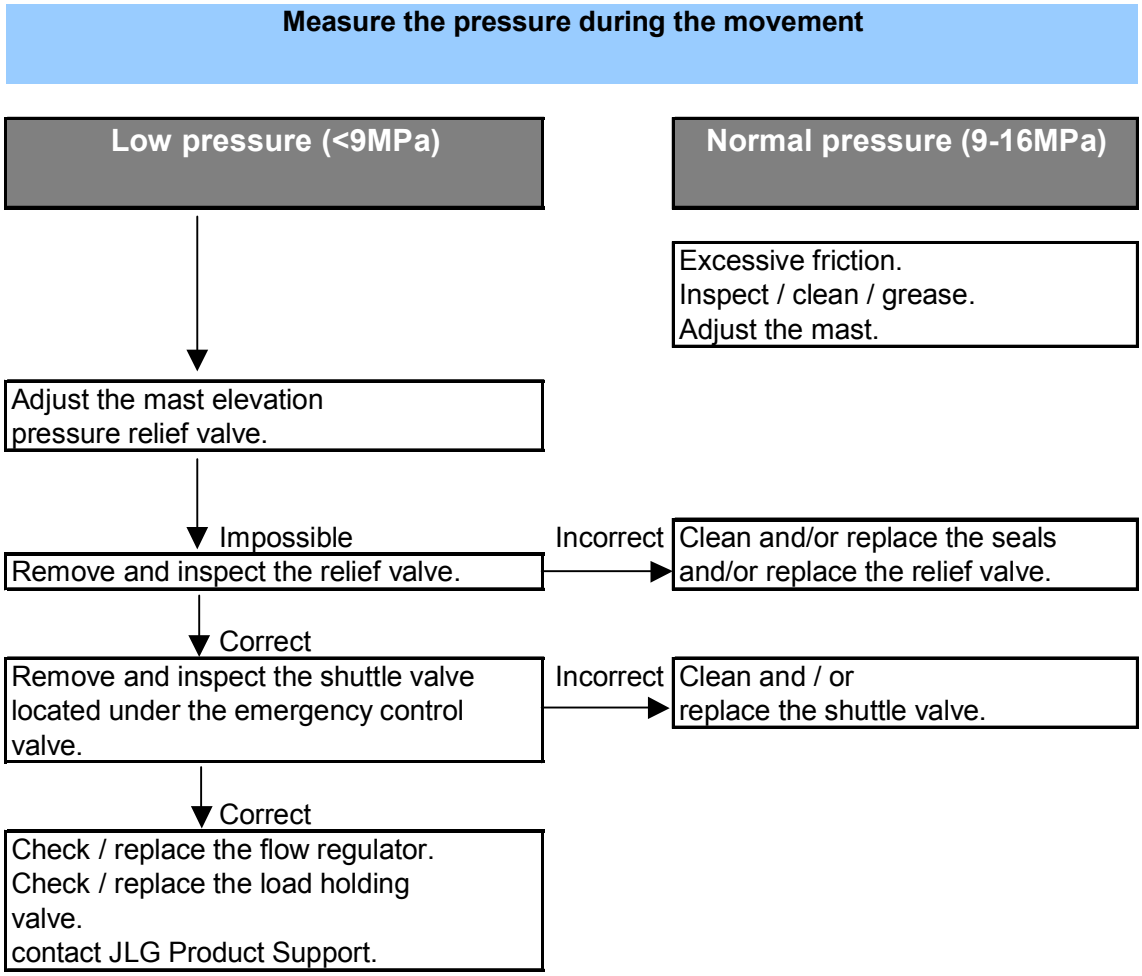


Diag VI

Mast raising problems
- Impossible
- reduced speed

Preliminary checks :

This movement is the only one affected.
No external leak.
Battery charged correctly.
Battery connections in good condition.
The machine is on flat and horizontal ground.



Diag VII

Mast lowering problems

Preliminary verifications :

This movement is the only one affected
(Jib lowering function is operational).
No external lead.
Battery charged correctly.
Battery connections in good condition.
The machine is on flat and horizontal ground.

No lowering

- Measure voltage on terminals of coil MDE.
  - < 24V → Check / repair the coil connector. Check / repair the loom PC0193.
  - ⩾ 24V
- Measure the impedance of MDE -coil disconnected-
  - Other → Replace the coil.
  - 18 - 25 Ω
- Check the electrovalve (operation).
  - Incorrect → Clean and / or replace the seals and/or replace the valve.
  - Correct
- Check the load holding valve (operation).
  - Incorrect → Clean and / or replace the seals and/or replace the valve.
  - Correct
- Contact JLG Product Support.

Lowering only if enable is kept depressed

- Check the check valve on pump outlet for leaks.
  - Incorrect → Clean and/or replace the valve.
  - Correct
- Check the piloted check valve on auxillary manifold for leaks.
  - Incorrect → Clean and/or replace the valve.
  - Correct
- Check the check solenoid valve MDE for leaks.
  - Incorrect → Clean and/or replace the valve.
  - Correct
- Check the general pressure relief valve for leaks.
  - Incorrect → Clean and/or replace the seals and/or replace the relief valve.
  - Correct
- Check the load holding valve (leak on piloting).
  - Incorrect → Clean and/or replace the seals and/or replace the valve.
  - Correct
- Contact JLG Product Support.

Lowering at reduced speed

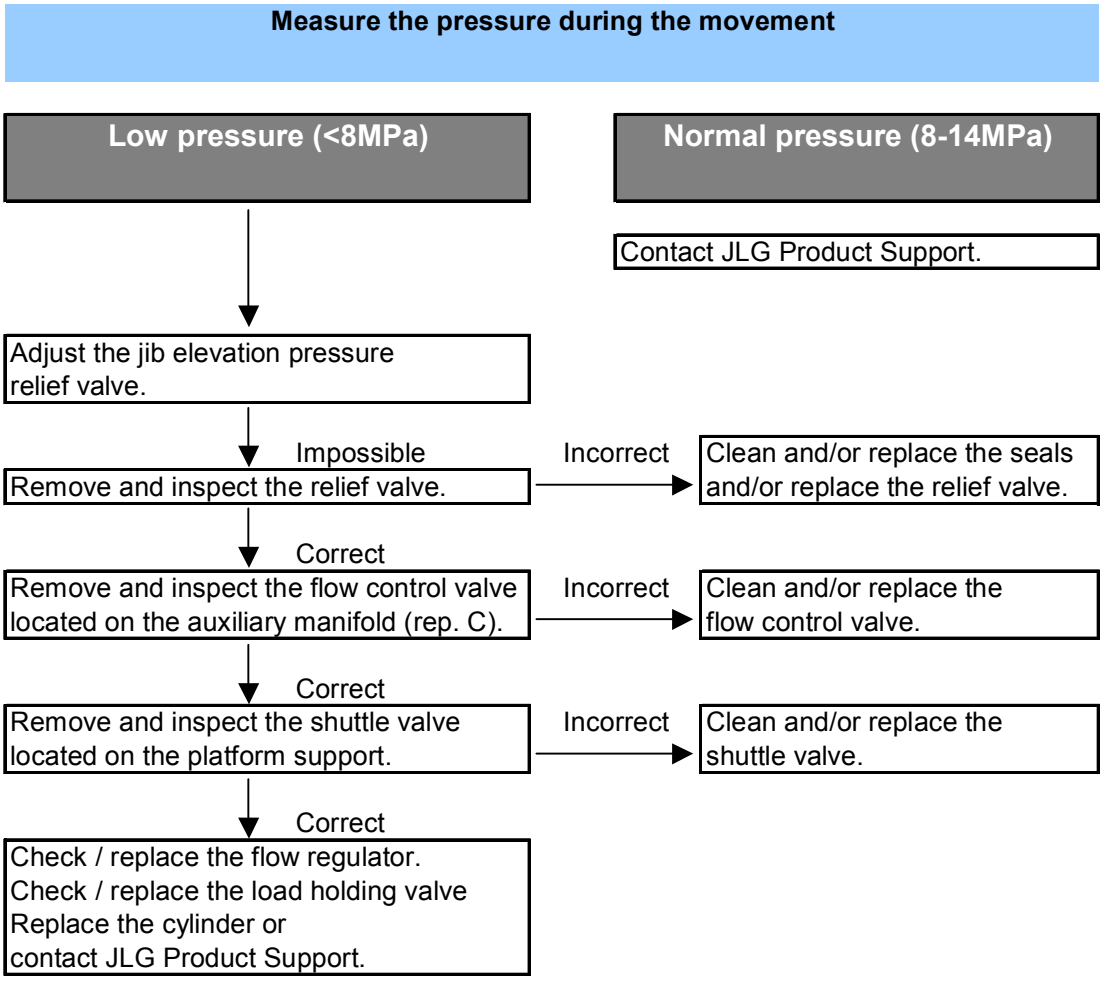
- Check the flow regulator on the cylinder.
  - Stuck → Clean and/or replace the regulator.
  - Correct
- Excessive friction
  Inspect / clean / grease / adjust the mast.

Diag VIII

Jib raising problems

Preliminary checks

This movement is the only one affected.
No external leak.
Battery charged correctly.
Battery connections in good condition.
The machine is on flat and horizontal ground.

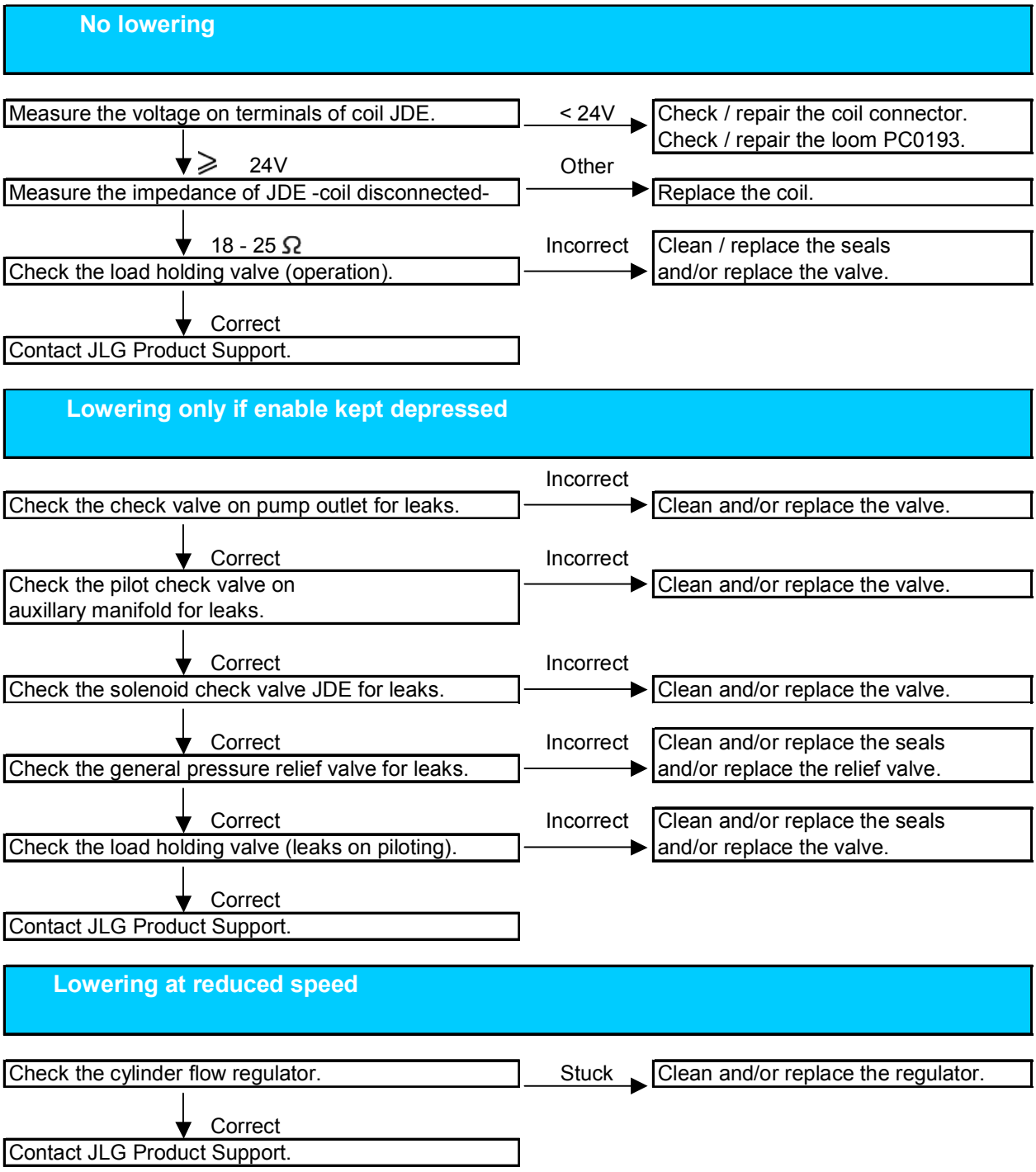


Diag IX

Jib lowering problems

Preliminary verifications :

This movement is the only one affected
(Mast lowering function is operational).
No external leak.
Battery charged correctly.
Battery connections in good condition.
The machine is on flat and horizontal ground.



Diag X

Slewing problems

Preliminary checks :

This movement is the only one affected.
No external leak.
Battery charged correctly.
Battery connections in good condition.
Machine on flat and horizontal ground.

Measure the pressure during the movement

Low pressure (<4MPa)

Adjust the associated pressure relief valve.

↓

Impossible → Remove and inspect the relief valve.

Incorrect → Clean and/or replace the seals and/or replace the relief valve.

↓ Correct

Check the emergency control valve for leaks.

Incorrect → Replace the control valve and/or contact JLG Product Support.

↓ Correct

Check / repair / replace the slewing motor or contact JLG Product Support.

Normal pressure (4-8MPa)

Check the external state of the slewing system.
- protections in place
- abscence of foreign body
- greasing

Incorrect → Clean / repair / grease and operate.

↓ Correct

Remove and inspect the slewing reducer.

Endommagé → Repair / replace the reducer or contact JLG Product Support.

↓ Correct

Check / repair / replace the slewing motor or contact JLG Product Support.

Diag XI

Steering problems

Preliminary checks :

This movement is the only one affected.
No external leaks.
Battery charged correctly.
Battery connections in good condition.
The machine is on flat and horizontal ground.

Measure the pressure during the movement

Low pressure (<6MPa)

Adjust the associated pressure relief valve.

Impossible

Remove and inspect the relief valve.

Incorrect → Clean and/or replace the seals and/or replace the relief valve.

Correct

Check / repair / replace the steering cylinder.

Normal pressure (6-12MPa)

Check for the presence of mechanical jamming in the steering system.

Blocages → Repair and/or contact JLG product support.

Correct

Check / repair / replace the steering cylinder.

CHAPTER 4

ADJUSTMENTS

Introduction

The control and maintenance procedures described in this chapter require specific competences and tooling. We recommend that these operations are performed only by authorized and qualifed personnel.

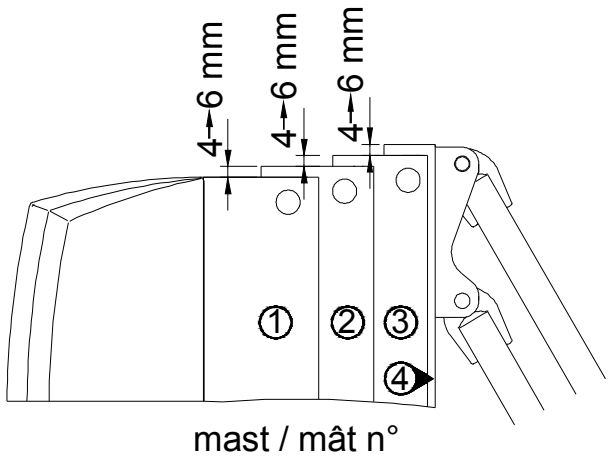
If you have any queries concerning operating, control and maintenance procedures, please contact your approved JLG distributor.

Certain operations require removal of covers or protection housings. All covers or protection housings must be installed before resuming operation.

For certain adjustments, it may be necessary to operate the machine with the operator outside the platform. In those cases, operate the machine from the breakdown controls (§4-2 Operator's manual).

4.1 Lifting chains tension adjustment.

The lifting chains of a same stage must have an identical tension.
The chains must always be tensioned so that, without any load in the platform, the mast sections are slightly offset towards the top :



Control of tension :

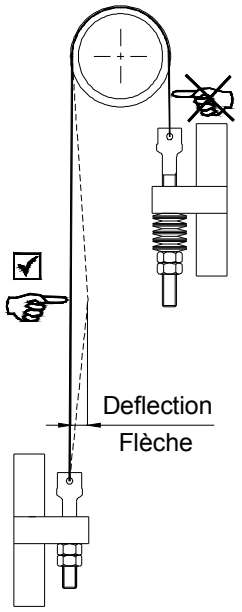
Tension must be controlled after the mast was partially lowered.

A: Chain n° 1 stage (mast sections 1 to 3)
1- Fully raise the mast,
2- Lower the mast by 50 cm approximately.

B: Chain n° 2 stage (mast sections 2 to 4)
1- Raise the mast by a few meters,
2- Lower the mast, stop at approximately 50 cm from the lowered position.

For positions A and B :

1- Exert an identical pressure on each chain (see drawing below). Both chains must have the same deflection.
2- Adjust if necessary.
3- Ensure the chains are not twisted.



◀ No significant deflection.

Tighten the nut on the anchor of the chain which is too slack or loosen the nut on the anchor of the chain which is too tight, ensuring the final offset of the mast sections is kept.

4- Check the presence and correct tightening of the locknut on each chain anchor.

4.2 Adjustment of telescopic mast alignment and play.

DANGER

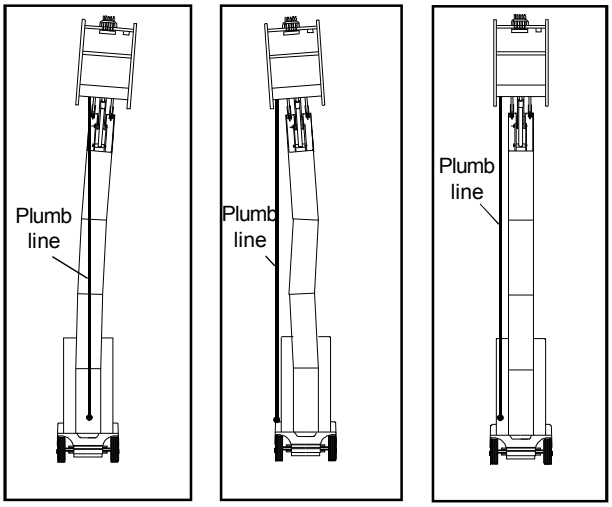
Adjustment of the transversal play between the mast sections must be performed by trained and qualified personnel.

1- Clean the inside walls of the mast sections to remove the old grease.
2- Loosen the locknuts on the roller pins.
3- Reduce the transversal play by tightening the roller pins in succession.

CAUTION

Do not suppress the play completely : for the mechanism to work, a minimum play is necessary.

4- Use a plumb line to ensure the vertical alignment of the mast sections is kept :



INCORRECT **CORRECT**

5- Tighten the roller pin locknuts.
Torque value : 1000 N.m approximately.

CAUTION

If during adjustment one of the mast sections jams, stop the lowering movement and raise the mast to retension the chains. Loosen slightly the roller pins of the jammed mast.

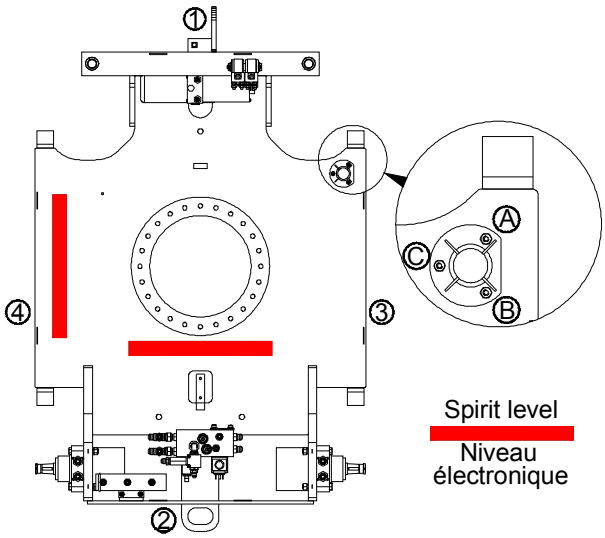
6- Lubricate the mast sections that were cleaned previously.

Controls after adjustment :

- Fully raise and lower the telescopic mast three times with a load of 200 Kg evenly distributed in the platform.
- If no jamming occurs, fully raise and lower the telescopic mast three times with one person in the platform.
- If jamming occurs during lowering, loosen slightly the roller pins of the jammed mast section.
- Check the torque value of all roller pin locknuts.

Do not hesitate to contact your approved JLG distributor for more information.

4.3. Control-Tilt sensor setting



Control :

1- Position the control panel selector on "**I**".
2- Chock the rear wheels.
3- Place a spirit level (digital display) on the chassis lengthways from **(1)** - **(2)** .
4- Using a jack of sufficient capacity, lift the front of the chassis in **(1)** :
   - Stop as soon as the green light on the sensor switches off (jerks linked to the manoeuvre stopped). Read the angle of the chassis: value **(a)**.
5- Chock the front wheels.
6- Using a jack of sufficient capacity, lift the rear of the chassis in **(2)** .
   - Stop as soon as Indicator light switches off: value **(b)**.
7- Place the spirit level across the chassis from **(3)** - **(4)** .
8- Using a jack of sufficient capacity, lift the right hand side of the chassis in **(3)** .
   - Stop as soon as Indicator light switches off: value **(c)**.
9- Using a jack of sufficient capacity, lift the left hand side of the chassis in **(4)** .
   - Stop as soon as Indicator light switches off: value **(d)**.

NOTE
Ensure the tilt sensor rests correctly on the support cap nuts.

Recordings	Authorized values	Others refer to :
a+b	(c+d) ± 0,2°	PB1
a+b	3,6° to 4,0°	PB2
c+d		
a	1,8° to 2,0°	PB3
b		
c		
d		

PB1 : Replace tilt sensor.
PB2 : Replace tilt sensor.
PB3 : Adjust.

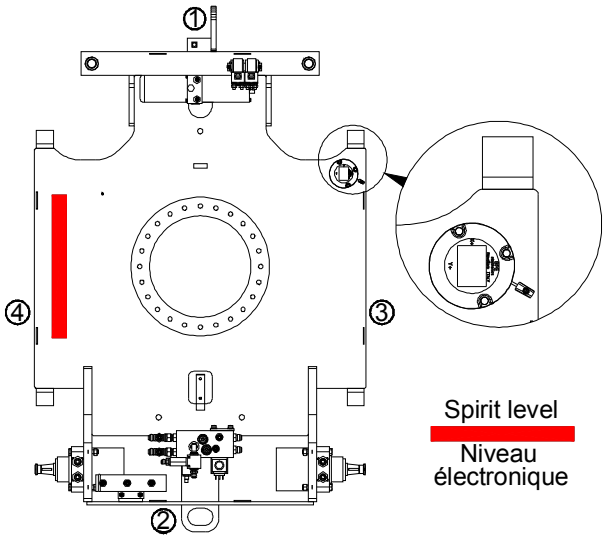
Adjustment :

- Position the machine that the chassis is horizontal in the **(1)** - **(2)** and **(3)** - **(4)** directions (blocks under the wheels).
  Setting tolerance ±0.1°.
- Remove the protection of the calibration wire, link it to the battery (-) until the sensor's green light flashes.
- The sensor is adjusted.
- Reinstall the wire protection.

NOTE
If a symetry fault is corrected, the setting has to be checked again in both direction before the machine is returned to operation.

4.4. Control-Incline sensor adjustment

The "inclination detection" is integrated to the tilt sensor.



Control :

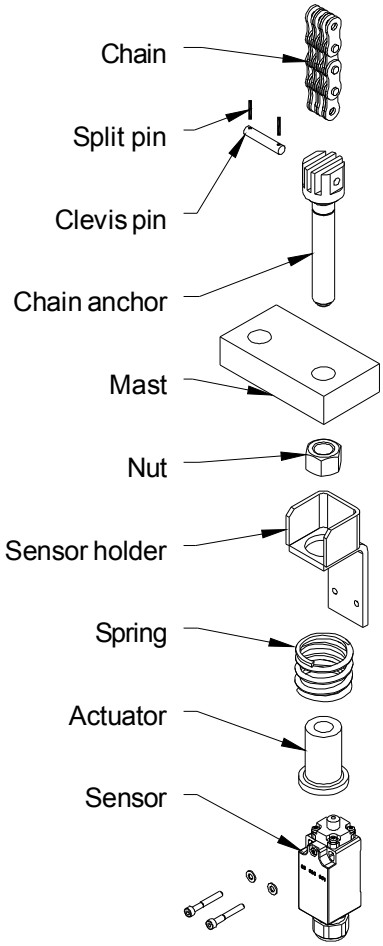
1- Disconnect the double pole connector from the sensor.
2- Connect an ohmmeter to the sensor.
3- Chock the rear wheels.
4- Place a spirit level (digital display) lengthways on the chassis in the direction **(1)** - **(2)** .
5- Using a jack of sufficient capacity, lift the front of the chassis in **(1)** :
   - The ohmmeter switches from the indication "closed circuit" (0 Ω) to "open circuit" (infinite Ω) for a chassis incline of 2.8° to 3.2°.
6- Repeat the operation with the wheels chocked at the front and lifting the rear of the chassis in **(2)** :
   - Same behaviour / same values as previously.

Adjustment :

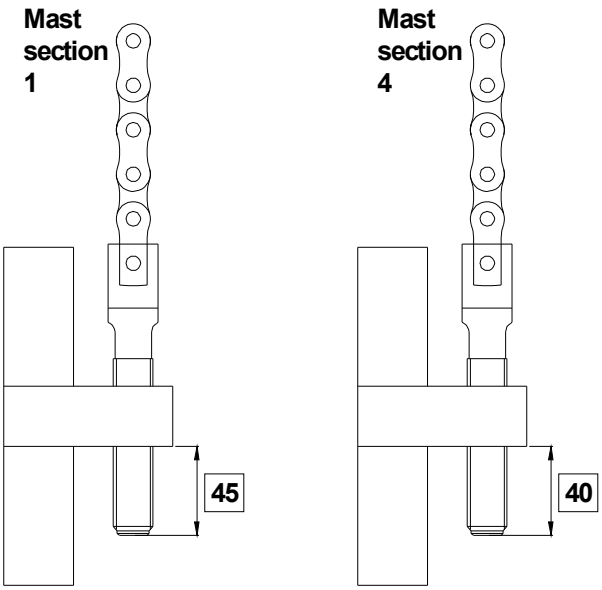
- The setting of the tilt sensor must respect the tolerances of the "inclination detection" indicated above.
- Should it not be the case : replace the tilt sensor.

4.5. Adjustment for slack chain sensors

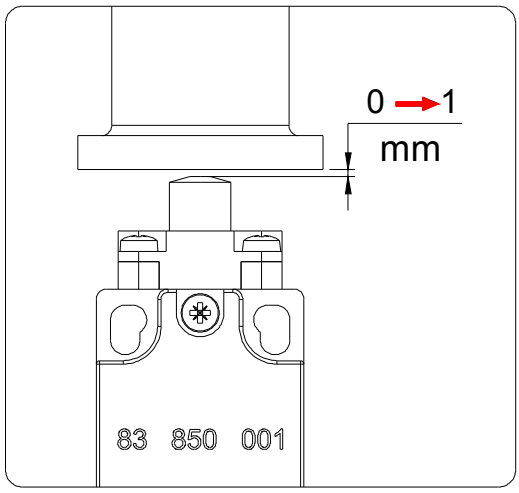
Presentation :



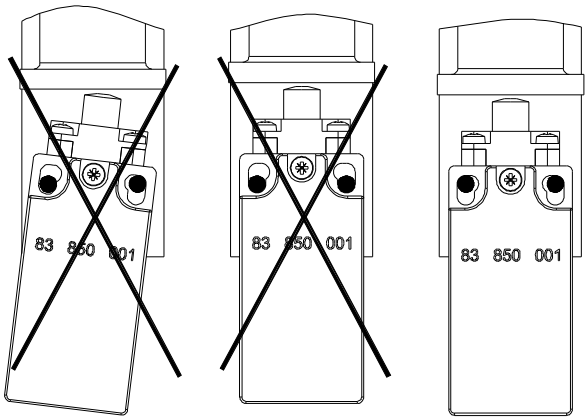
Adjustment size of the chain anchor free length :



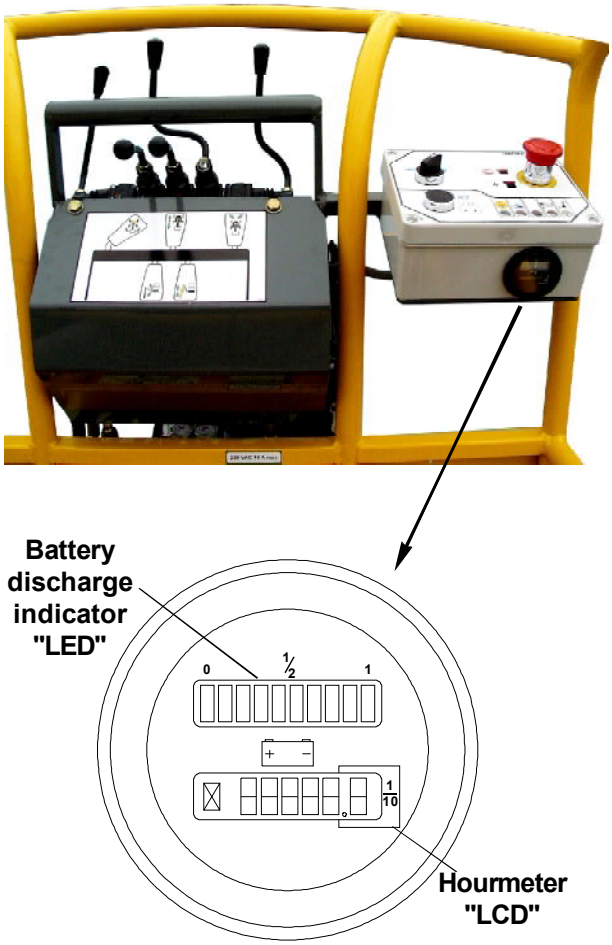
Corresponding to:



NOTE
Ensure the sensors are correctly installed.



4.6. Battery discharge indicator adjustment



Discharge indication, reading from right to left:
5 green led followed by 3 yellow, then 2 red.

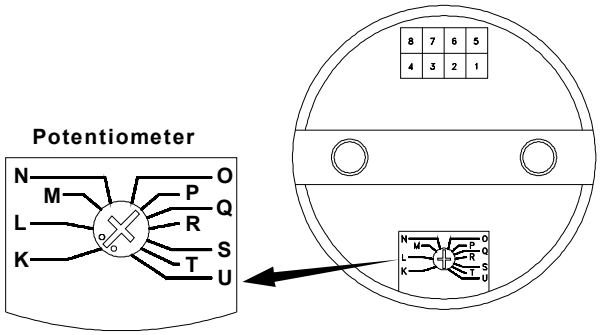
- One red led flashes: 70% discharge.
- Both red leds alternate flash: 80% discharge.
  This threshhold is the maximum discharge acceptable to preserve the performance of the batteries.
  It can be adjusted by a potentiometer located at the rear of the indicator. It is set at the factory function of the batteries used and based on standard operating cycles. The threshhold may need adjusting if the operating cycle is very different from the standard cycle (leading to a faster or slower discharge).

NOTE

The setting can only be modified on a battery that was submitted to a minimum of 15 charge - discharge cycles.

NOTE

The battery is 80% discharged when the electrolyte density is of 1,150 kg/l.



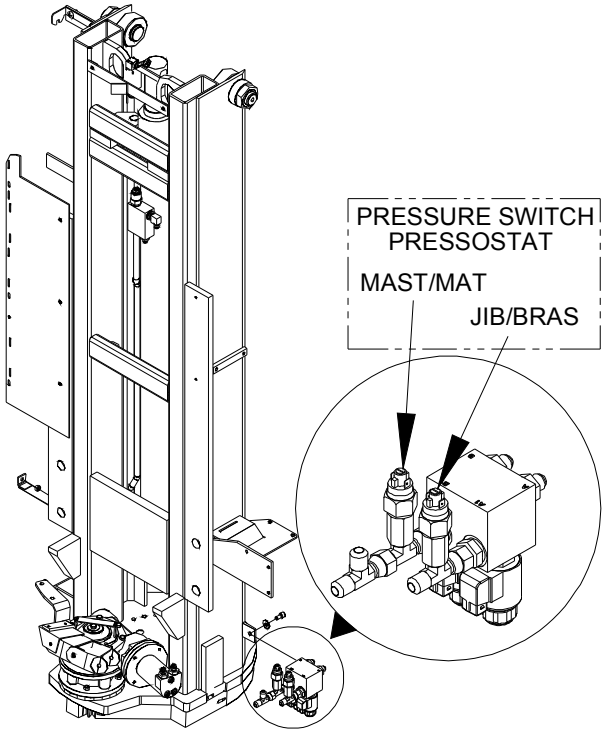
To adjust the cut out threshhold, proceed as follows:

- Measure the battery electrolyte density when the power is cut off (both red leds flash alternately).
- Adjust the cut out threshhold using the potentiometer knowing that each letter corrects the battery electrolyte density by 20 points.
  For example, if the potentiometer is set on the letter **L** and the electrolyte density of 1,170 kg/l when the power was cut off:
  - The density will be 1,150 kg/l on the next discharge cycle if the setting is modified to the letter **K**.
  - The density will be 1,190 kg/l on the next discharge cycle if the setting is modified to the letter **M**.

NOTE

- After any adjustment, check the electrolyte density at cut off point over several charge/ discharge cycles.
- Trying to "increase" the battery capacity by exceeding the 80% discharge threshhold will lead to:
1- malfunctions of the electrical system due to lack of energy.
2- damage to the batteries at short or medium term.

4.7. Adjustment of flashing light pressure switches



These pressure switches (range 10-20 bar, NO contact) allow the flashing lights (movement alarm) to be supplied during the mast and jib lowering "without energy" (ie : pump not supplied).

Adjustment :

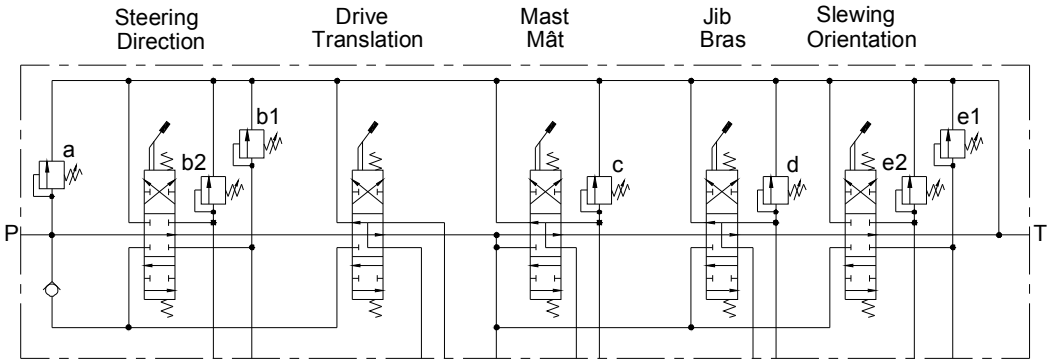
1- The flashing lights work permanently:
As soon as the control circuit is supplied (Emergency Stop Switches off and key on "**I**") the lights work.
Disconnect the pressure switches in turn to identify the element set incorrectly or faulty.
Tighten the setting screw until the lights switch off.

2- The flashing lights do not work or stop during mast or jib lowering:
Loosen the setting screw on the corresponding pressure switch until normal operation.

4.8. Hydraulic adjustments

General procedure for pressure limit switches setting
- unless otherwise indicated -

1- Connect a pressure gauge 0-40 MPa (0-400 bar) to the pressure plug (mini-mess type) located on the pressure filter outlet.
2- Loosen the locknut and loosen the relief valve setting, without removing it.
3- Control the movement required to the end of its course at maximum speed (lever fully activated) (refer to each case individually hereafter).
4- Tighten the relief valve setting screw progressively until the required pressure can be read on the gauge ± 0.5 MPa (5 bar).
5- Torque the locknut (45 N.m) while holding the setting screw in place (to preserve its setting).



4.8.1. Upper control valve

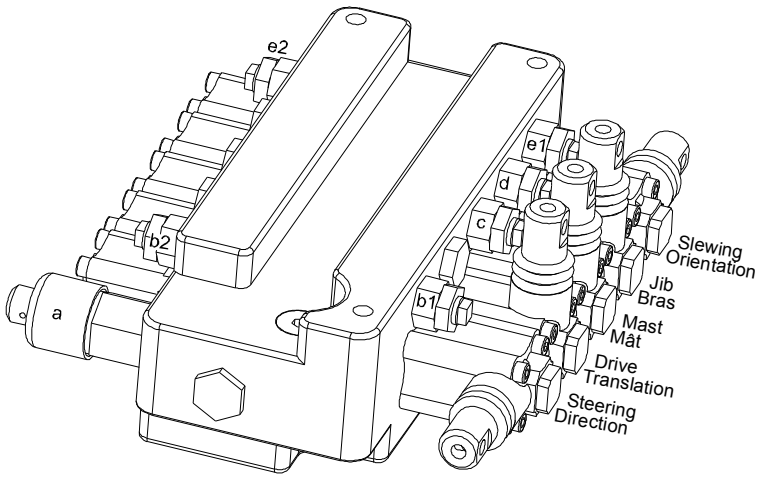
Main pressure relief valve (a):
- Adjustment allowed with:
  mast descent.
- Pressure required: 23 MPa (230 bar).

Steering pressure relief valve (b):
- Adjustment allowed with:
  left steering **(b1)**,
  right steering **(b2)**.
- Pressure required: 12 MPa (120 bar).

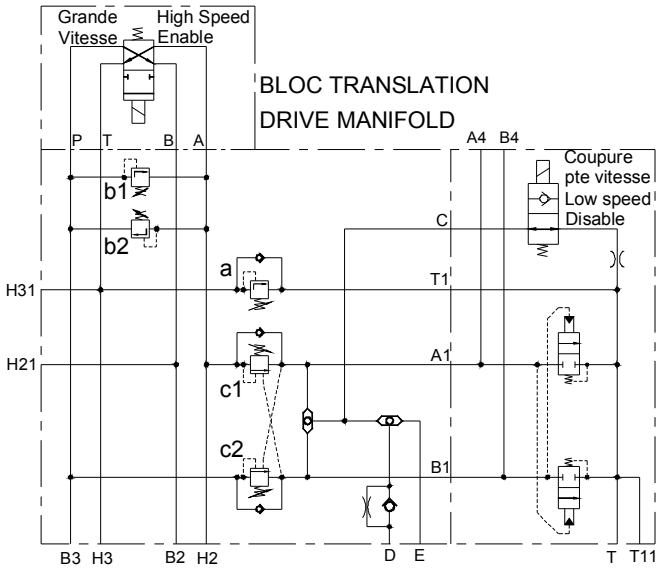
Mast elevation pressure relief valve (c):
- Adjustment allowed with:
  Mast elevation.
- Pressure required: 16 MPa (160 bar).

Jib elevation pressure relief valve (d):
- Adjustment allowed with:
  Jib elevation.
- Pressure required: 14 MPa (140 bar).

Slewing pressure relief valve (e1), (e2):
- Adjustment allowed with:
  right slewing movement **(e1)**,
  left slewing movement **(e2)**.
- Pressure required: 8 MPa (80 bar).



4.8.2. Drive manifold.



Motor make up flow relief valve (a) :

- Adjustment allowed with:

  reverse drive, selector on 

  rear wheels chocked.
- Pressure required:
  14 MPa (140 bar).
  (corresponds to a 8 MPa (80 bar) opening start).

Motor protection relief valves (b1), (b2) :

- Adjustment allowed with:

  - **(b1)** : forward drive, selector on  ,

  front wheels chocked.

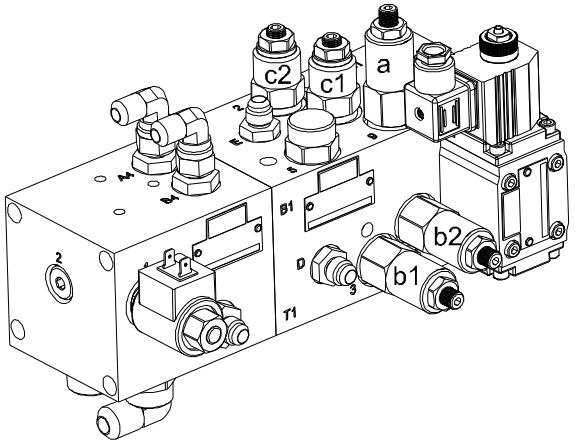
  - **(b2)** : reverse drive, selector on  ,

  rear wheels chocked.
- Pressure required:
  adjust to 21 MPa (210 bar), tighten the setting screw by a further 1/4 turn, then torque the locknut (45 N.m) holding the setting screw in place.

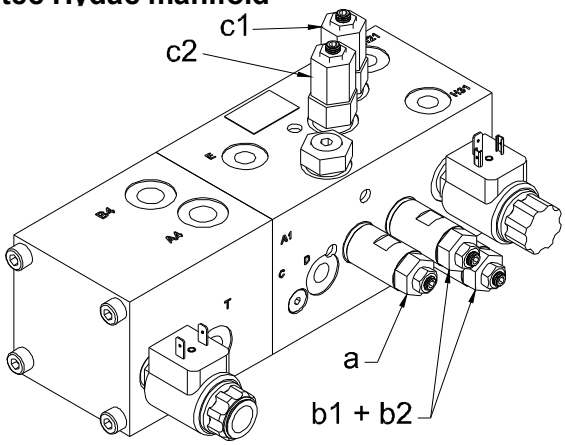
Counterbalance valves (c1), (c2) :

- Loosen the locknut.
- Fully tighten the setting screw.
- FP hydraulique manifold :
  Valve **(c1)** : loosen the setting screw by 3 turns to $3^{1/4}$ turn (reverse drive).
  Valve **(c2)** : loosen the setting screw by 2 and 1/2 turn to $2^{3/4}$ turn (forward drive).
- Flutec Hydac manifold :
  Valve **(c1)** and **(c2)** : loosen the setting screws by 7 and 1/2 turn.

FP hydraulique manifold



Flutec Hydac manifold



Low gear enable :

- Drive the machine at low speed, selector on  for 15 minutes to warm up the hydaulic circuit.
- Time the movement of the machine in foward and reverse drive at low speed (selector on ).
- The drive movement over 10 meters should last between 50 and 60 seconds.
- If the machine is too slow, loosen the setting screw by 1/4 turn, then tighten the locknut while holding the setting screw in place.
- If the machine is too fast, tighten the setting screw by 1/4 turn, then tighten the locknut while holding the setting screw in place.
- Test the machine to ensure the low speed is ajusted correctly.

⚠ CAUTION

Any maintenance on the counterbalance valves requires verification of the slow speed. In no way should the low speed exeed 0.72km/h.

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CHAPITRE 5

REMOVAL - INSTALLATION

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5.1. General

5.1.1. Safety

5.1.1.1. Handling

During maintenance, do not attempt to manually lift heavy parts when hoisting equipment should be used. Never place or leave heavy parts in an unstable position.When raising a portion of a work platform - or a complete work platform - securely block the work platform and support the weight of the machine on blocks (rather than by lifting equipment).

When using hoisting equipement :

- Follow hoist manufacturer's recommendations
- Use lifting devices that will allow you to achieve the proper balance of the assemblies being lifted and ensure safe handling.

Unless otherwise specified, all removals requiring hoisting equipment should be accomplished using an adjustable lifting attachment. All supporting members (chains and cables) should be parallel to each other and as near perpendicular as possible to the top of the object being lifted.

⚠ CAUTION

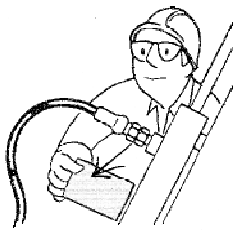
The capacity of an eybolt diminishes as the angle between the cable and the vertical increases. Eyebolts should only have stress in tension.

Any removal / installation should be done on flat and horizontal ground with the machine fully lowered whenever possible.

5.1.1.2. Hydraulic circuit

Oil spray can damage the skin or cause burns. Any tissue damage, however small, must be treated by a specialist doctor. To prevent injury:

- Never attempt to find an leak with your hand (use a piece of cardboard for example).



- Any maintainance should be done with the platform in lowered position (jib and mast).
- Loosen hydraulic fittings and filters slowly to release the residual pressure progressively.

5.1.1.3. Electrical circuit

In case the battery electrolyte contacts the skin or the eyes, clean with fresh water and consult a doctor immediately.
To prevent the electrolyte from contacting the skin or any other part of the body, wear glasses, gloves and a rubber apron for any maintenance work on the battery.

To avoid short circuits, disconnect the battery (main circuit breaker) for any maintenance work on the electrical circuit.
During any work on the disconnected battery, remove rings and metallic bracelets.

5.1.1.4. Maintenance of the structure

Do not grind or weld near a battery (explosion risk).
When a structural component has be replaced, the machine must be submitted to an overload test.

5.1.2. Cleanliness

It is important to keep dirt out of working parts to preserve the long life of the machine. Packing of seals and filters guarantees the cleanliness of the content. Whenever hydraulic lines are disconnected, clean the adjacent area as well as the point of disconnection, cap the openings to prevent entry of foreign material in the circuit.
The same conditions on cleanliness apply to mechanical parts.

Clean and inspect all parts. Make sure:
- All passages and holes are open.
- Parts are covered to keep them clean.
- Parts are clean when they are installed.
- New parts are left in their packaging until they are ready for assembly.
- Rust preventive compound has been removed from all machined surfaces of new parts before they are installed (except leaf chains).

Platform cleaning :

⚠ CAUTION

Prior to platform cleaning, always disconnect the battery from the platform circuit, the charger from the power supply, the 110V or 220V power in the work platform (optional equipment) must be off.

Cleaning externally :

Clean the platform with a detergent mixed with water (water spray, sponge, cloths).

⚠ CAUTION

High pressure cleaners should only be used at a maximum pressure of 50 bars and a maximum water temperature of 70° C.

Do not direct jets onto :
- The electrical boxes and components,
- The electronic controller,
- The battery,
- The charger,
- The electrical motors,
- The cylinder rods and seals,
- The lifting chains.

Dry carefully the platform (compressed air, cloths...) and lubricate the machine prior to returning it to service.

Pollution :

Storage / retention tanks for oil and washing water, waste containers for filters, cleaning paper or cloths.. must be made available to ensure waste is being recycled or disposed of in accordance with the regulations in force.

5.1.3. System malfunction

When analyzing a system malfunction, use a systematic procedure to locate and correct the problem:

- Determine the problem.
- List all possible causes.
- Devise checks.
- Conduct checks in a logical order to determine the cause.
- Consider the remaining service life of the components against the cost of parts and labour necessary to replace them.
- Make necessary repairs.
- Recheck to ensure that nothing has been overlooked.

5.1.4. Disassembly / Assembly

When assembling or disassembling a component or system, complete each step in turn:

- Do not partially assemble one part and then start assembling another part.
- Make all adjustments as recommended.
- Always check the job after it is completed to ensure that nothing has been overlooked.
- Recheck various adjustments by operating the machine before returning it to the job.

5.1.5. Parts replacement

Parts found damaged or out of tolerance during maintenance should be replaced. Refer to the corresponding Spare Parts Manual for proper replacement parts.
When a structural component has been replaced, the machine must be submitted to an overload test.

5.1.6. Electrical wires and cables

Always disconnect the batteries prior to working on the electrical system

When removing or disconnecting a group of wires or cables, tag each one to ensure proper identification during assembly.

5.1.7. Dry charged battery

When transport regulations require the battery to be delivered dry charged, the battery cells must be filled with electrolyte up to 10 mm above cell plates upon receipt and before work platform operation.

⚠ CAUTION

Use only electrolyte specific to traction batteries.
Sulfuric acid density:
1,270 +/- 0,005 kg/l à 25° C

⚠ DANGER

Battery electrolyte (sulfuric acid) is extremely corrosive and could cause serious burns. It is essential to wear appropriate equipment (gloves, glasses, rubber apron...) to prevent the electrolyte from contacting the skin or any part of the body during filling or any maintenance work on the battery.

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NOTE
Battery cells must be filled at ambiant temperatures of between 10 and 40° C.

1- Uncap the battery cells.
2- Fill each cell in several stages until the electrolyte is 10 mm above the plates.
3- Imbibition : after filling, keep the cells capped and let the battery stand for a minimum of one hour.
4- During the imbibition period, check the following :
- Voltage at the terminals of each cell :
  Voltage should not be under 2V.
- Regular surveillance of electrolyte temperature :
  Electrolyte temperature should be under 10°C.
- Density of the cells at the end of the imbibition :
  Density should not go down by more than 0,02 kg/l (measure at 25°C).
5- If one of the criteria described in 4 is not met, proceed with an equalisation charge before operating the machine.

NOTE
Charge the battery only after electrolyte temperature is below 40°C.

NOTE
A battery does not reach its full capacity until it has been cycled approximately 30 times. It is recommended not to exceed 70% of discharge during that period.
To ensure a correct service life for the battery, discharge depth should not exceed 80%.

5.1.8. Torque values

Unless otherwise indicated (§5.1.8.1 and §5.1.8.2 or in chapter 5), torque values to be applied must correspond to the grade of bolts, studs and nuts used.

When maximum recommended torque value has been exceeded, the fastener should be replaced. If the excess torque was applied to an fastener installed in a tapped hole, the thread must be checked with a gauge and the bolt or stud must be replaced.

The values in the charts below correspond to the use of galvanised fasteners in their delivery condition: no grease, nor degreaser. These value are for torquing using a torque wrench (precision higher than 10% : covers all hand tools).

			Torque values for bolts, nuts and studs													
Grade	Tensile strength N/mm²	Unit	M4 x70	M5 x80	M6 x100	M8 x125	M10 x150	M12 x175	M14 x200	M16 x200	M18 x250	M20 x250	M22 x250	M24 x300	M27 x300	M30 x350
8.8	785	N.m	2,66	5,2	9,1	22	44	76	121	189	261	370	509	637	944	1280
10.9	981	N.m	3,91	7,7	13,4	32	64	111	178	278	384	544	748	936	1386	1880
12.9	1177	N.m	4,57	9	15,7	38	75	130	209	325	449	637	875	1095	1622	2200

Torque values for fittings					
JIC	N.m	BSPP	N.m	Metric	N.m
JIC 7/16	15	BSPP 1/4	20	M14x150	38
JIC 9/16	30	BSPP 3/8	34	M18x150	51
JIC 3/4	50	BSPP 1/2	60		
JIC 7/8	69	BSPP 3/4	115		

5.1.8.1. Wheels and wheel motors

⚠ CAUTION

Do not use impact wrench to torque the hubs on the motor shaft and the wheel nuts.

⚠ CAUTION

The bearing surfaces of the hub and motor shaft must be clean and free from damages.
Grease on installation.
Install the key and lockpin on the nut.

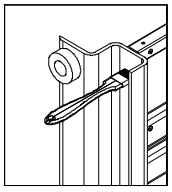
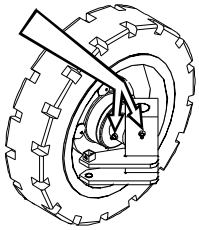
Wheel motors : 80 N.m.
Hubs : 200 N.m (± 10 N.m).
Wheel nuts : 150 N.m.

5.1.8.2. Turntable bolts

The slewing ring should be installed following a very specific installation procedure. For further information, please refer to the corresponding paragraph.

5.1.9. Lubrication

LUBRICATION CHART

LOCATION	TYPE OF LUBRICANT	LUBRICATION INTERVALS	QUANTITY OF LUBRICANT	APPLICATION
1. Mast profiled sections	**B**	Every 125 hours of operation or after each cleaning or more often if the work platform is used or stored in a dusty or corrosive environment.	N/A	1. Clean the inside of the profiled section to remove the old grease. 2. Lubricate the inside of the profiled section using a brush  3. Operate the mast and lubricate again
2. Lifting chains	**D**	Every 125 hours or once every 30 hours of operation or more often if the work platform is used in a very dusty or corrosive environment.	N/A	The lubricant can be applied manually with a brush or by spraying. Apply the lubricant: - Longitudinally = in areas where the joints are under small load to facilitate penetration of the lubricant - Transversally = to enable the lubricant to reach the joint.
3. Wheel bearings and steering pivot	**E**	Every 250 hours of operation	N/A	Grease nipples on each hub  (Remove the wheel to reach the nipples)
4. Turntable bearing track	**E**	Every 250 hours of operation	N/A	Grease nipple(s) on the turntable plate
5. Hydraulic tank	**A**	- Check daily - Change the oil after 1000 hours of operation or at least every 2 years.	approximately 22 l	Fill through the semi immersed filter.Check the level with the gauge on the reservoir. 
6. Return filter	Filter replacement intervals: after the first 50 hours of operation and every 250 hours thereafter.			
7. Pressure filter	Filter replacement intervals: after the first 50 hours of operation and every 250 hours thereafter.			
8. Inner teeth of the turntable bearing	**C**	Every 1000 hours of operation	Coat the teeth	1- Remove the protection cover. 2- Apply a thick coat of grease with a brush turning the bearing to reach all the teeth.

TYPE OF LUBRICANT

	STANDARD	LOW TEMPERATURE UP TO -35°C	FOOD COMPATIBLE	FOOD COMPATIBLE LOW TEMPERATURE
A	NERVOFLUID VG 32	NERVOL - EQUIVIS XV 32	NERVOL - AGROFLUID DVG 32	NERVOL - AGROFLUID
	NERVOFLUID DVG 32	NERVOL - HYDRELF XV 32	MOBIL - DTE FM 32	
	MOBIL DTE 13M	MOBIL - DTE 13M		

	STANDARD	LOW TEMPERATURE UP TO -35°C	FOOD COMPATIBLE	FOOD COMPATIBLE LOW TEMPERATURE
B	COMPLEX EP2	NERVOL - CRYOGREASE		
	MOBILUX EP2	MOBILITH SHC 220		

	STANDARD
C	MOBILTAC 81

	STANDARD	LOW TEMPERATURE UP TO -35°C
D	MOBIL DTE 16M	HYDRELF XV 32
	FREE FLOWING CHAIN	

	STANDARD
E	MOBILUX EP2
	COMPLEX EP2

A Reservoir
B Masts / Wheel hub / Telescope
C Turntable
D Lifting chains
E Swing bearing race

5.2. Maintenance and installation of guide rings

Bushing :

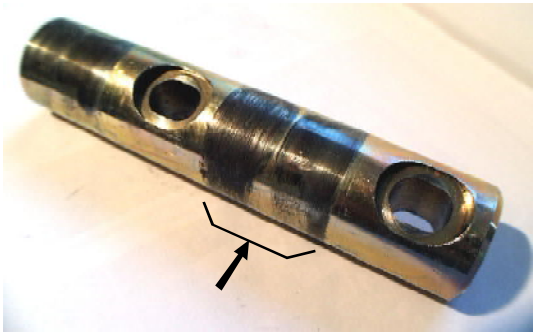
- Replace the damaged or worn bushes by bushes of identical characteristics (Refer to the Spare parts manual).
- The bushed used should not be reworked.
- Grease the bushing, the pin and bearing surfaces before their assembly.

Pin :

- Any rough or damaged surface on the pin will damage the bushing coating which will need replacing.
- Any rust or paint residue must be removed before installation of the pin.

A

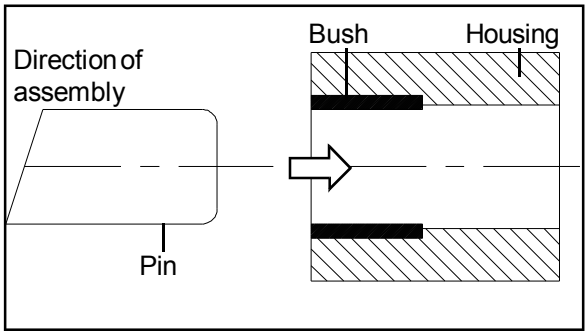
B



A : Normal condition of the bearing surface.
B : Bearing surface damaged, pin to be replaced.

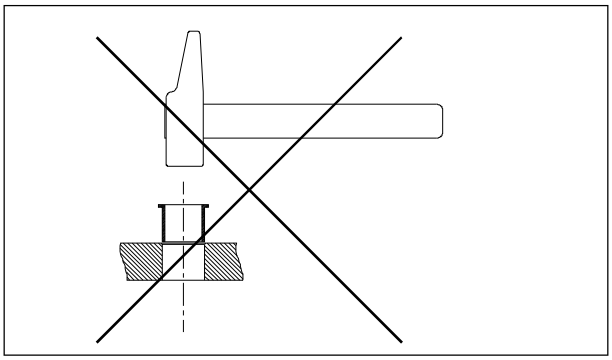
Bushings and pins :

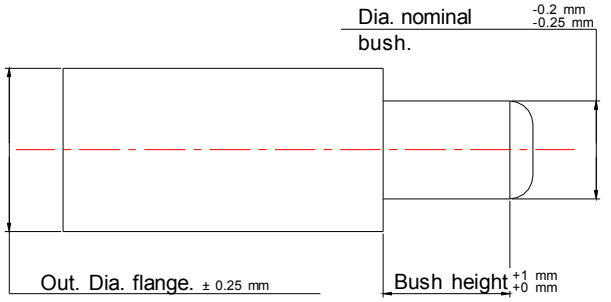
- When installing a pin, ensure the bushing and the pin are properly aligned.
- Coat the inside diameter of the bushing with clean grease before installing the pin.
- Pins have a chamfered or rounded end to prevent the coating on the bushing from being damaged during pin installation.



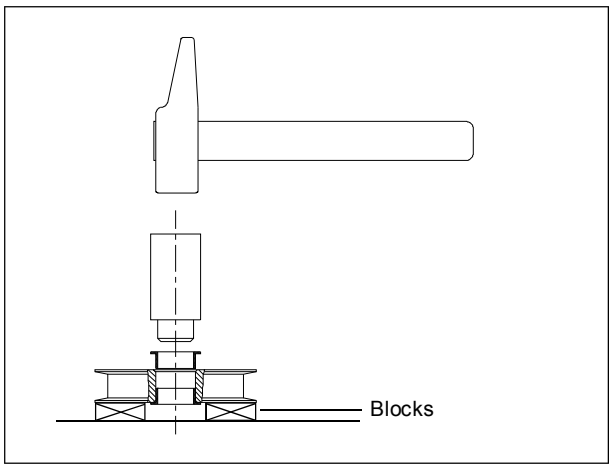
Installation of bushings :

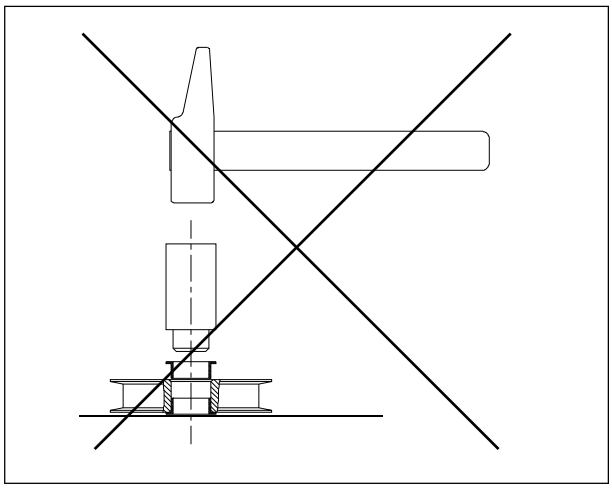
Bushings must be inserted in their housing with an appropriate driver with a smooth flat end (preferably in soft steel).
The outside diameter of the bushing must be slightly oiled to facilitate assembly.
Bushing, driver and housing must be correctly aligned during assembly.





Blocking must be used on parts that will receive two bushings to prevent damage to the flange of the lower bushing.





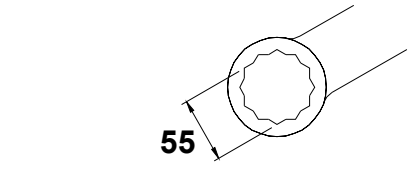
5.3. Mast roller removal

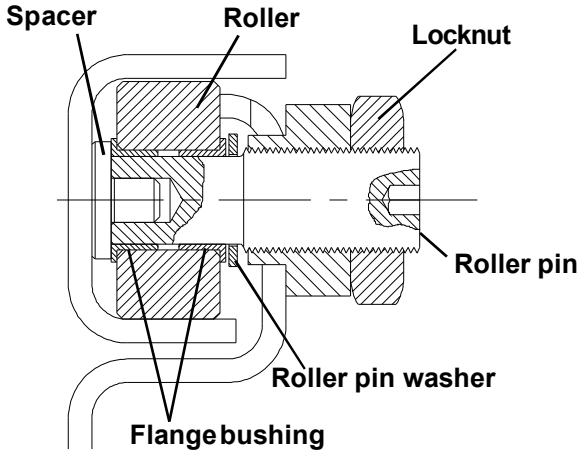
NOTE

The mast rollers (Qty 16) can be removed one by one without removing the telescopic mast assembly.

Upper rollers :

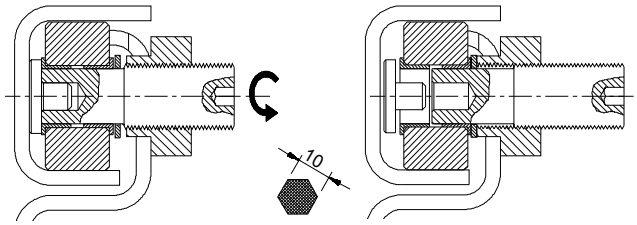
1- Retract the mast.
2- Unscrew the locknut from the roller pin using a polygonal spanner.
3- Unscrew the roller pin to release the bronze spacer as indicated below.





⚠ CAUTION

Hold on to the bronze spacer and the washer to prevent them from falling to the bottom of the mast profile.



⚠ CAUTION

Install the roller before removing another one.

Lower rollers :

NOTE

Prior to removing the lower rollers, ensure the upper rollers are installed.

Using the ground controls :

1- Raise the telescopic mast to access the roller to be removed.
2- Unscrew the locknut from the roller pin to be removed with a polygonal spanner.
3- Unscrew the roller pin to release the bronze spacer and the roller as indicated previously.

⚠ CAUTION

Install the roller before removing another one.

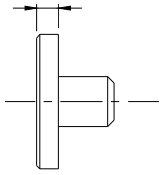
Rollers :

⚠ CAUTION

The bronze spacer must be replaced if its thickness is below 3,5 mm. Check the condition of the roller pin, bushing and roller before their installation. Replace damaged parts by original parts. Grease the bushing before its installation.

NOTE

3,5 mm mini

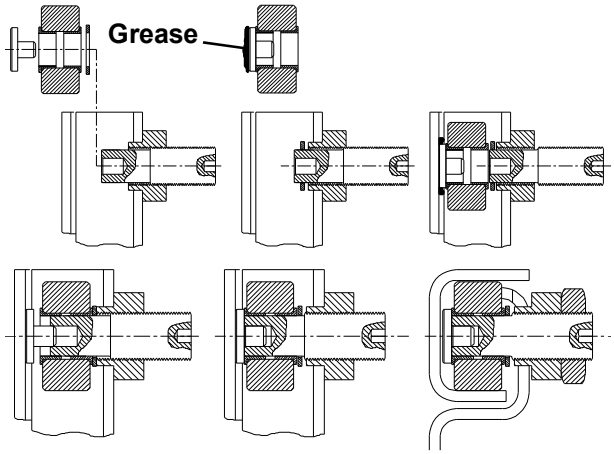


Minimum thickness of the bronze spacer = 3,5 mm

The rollers pins are generally delivered fitted. To remove the bronze spacer, screw a locknut on the pin until the roller and the spacer are separated.

Roller installation tips :

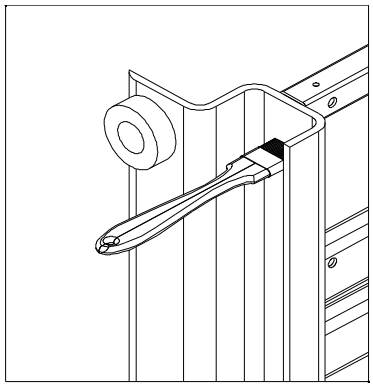
- Partly tighten the pin on the mast section and insert the washer on the pin.
- Apply grease on the spacer so that it "sticks" to the mast and does not fall to the bottom of the profile.
- Press the spacer on the mast profile and slide it. The roller, spacer and pin must be in line.



- Tighten the pin so that the roller slides on the pin.
- Reposition the spacer in line with the pin. Tighten the pin completely until the spacer is fully inserted.
- When the spacer is correctly inserted, loosen the pin by 1 turn to prevent the mast from jamming during the alignment adjustment. Install the locknut without tightening it (tightening of the locknut after mast alignement adjustment).

⚠ CAUTION

Mast profiles must be clean before replacing the bronze spacers. Mast profiles must be greased after the spacers have been replaced. The telescopic mast alignement must be ajusted.



5.4. Slewing ring

⚠ CAUTION

Removing the slewing ring entails the replacement of the pinion on the drive shaft and of EVERY washer, EVERY bolt and EVERY nut.

Fasteners used :

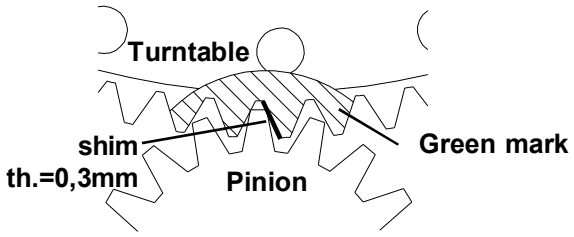
Fixation inner race to disk mast section 1:
Bolt CHc M12x70 - grade 10.9 quantity: 8
Bolt CHc M12x90 - grade 10.9 quantity: 18
Locknut M12 - grade 10.9 quantity: 18

Fixation outer race to chassis :
Bolt H M12x90 - grade 10.9 quantity : 24
Locknut M12 - grade 10.9 quantity : 24

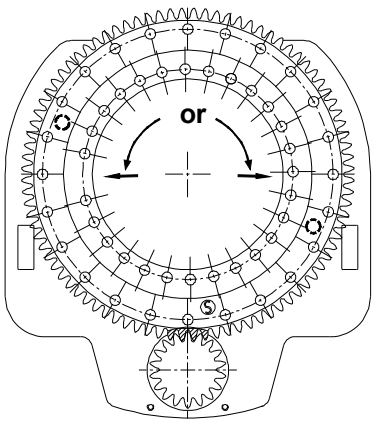
NOTE
Clean the ring bearing surfaces.
Remove properly old grease from every part.

Adjustment of play between teeth:

- Install the turntable without tightening the bolts in such a way that the maximum excentricity point (green mark on the bearing) is located opposite the pinion. Push the turntable bearing against the pinion and use a shim 0,3 mm thick to adjust the play between the teeth.



NOTE
Turn the bearing so that the ball insertion hole is located in one of the following positions:



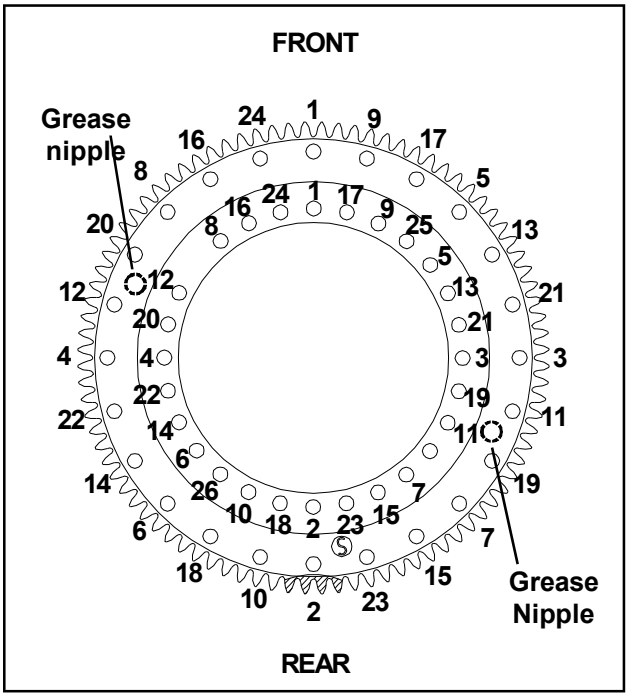
NOTE
The bolts must be torqued in two stages:
1- **EVERY bolt must be torqued at 80% of the final torque value: 93 N.m.**
2- **EVERY bolt must be torqued at final torque value: 117 N.m.**

Use of a pre-set torque wrench is greatly recommended.

Torquing order:

Lubrication: Grease thoroughly the bearing teeth.

NOTE
After intallation, slew the platform completely using the breakdown controls (hand pump) to ensure the turntable turns smoothly.



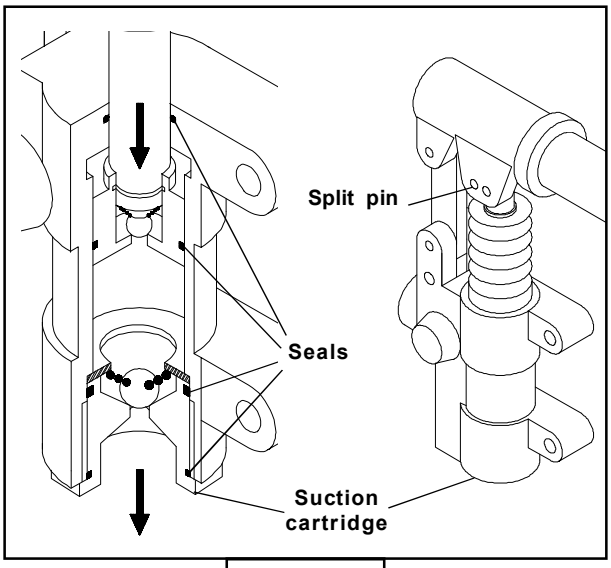
⚠ CAUTION

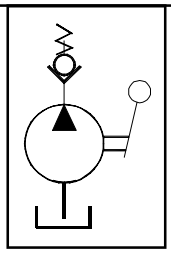
After replacement of the turntable, the platform must be tested in accordance with regulations in force.

5.5. Hand pump

Function :

- Oil supply to the hydraulic circuit of the work platform when using the breakdown controls :
  raising / lowering mast **(1)** and jib **(2)**,
  slewing **(3)**.
- Oil supply to the brake pilot circuit (See § 5.10).



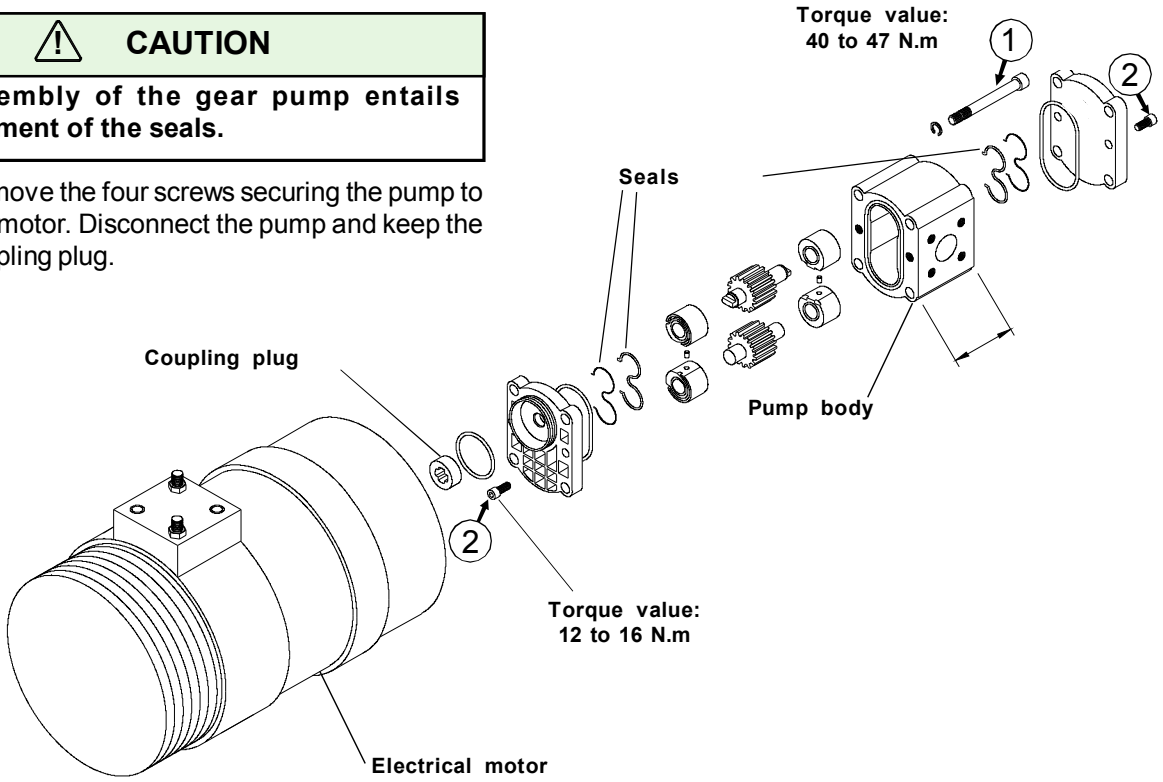


5.6. Hydraulic power unit

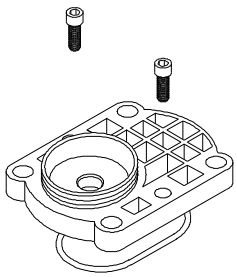
⚠ CAUTION

Disassembly of the gear pump entails replacement of the seals.

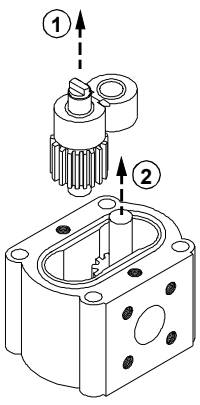
1- Remove the four screws securing the pump to the motor. Disconnect the pump and keep the coupling plug.



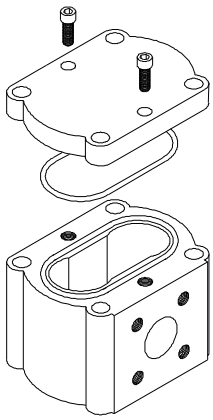
2- Place the pump vertically on a clean work surface and remove both screws securing the flange on the coupling side.Remove the flange.



3- Pull on the drive pinion shaft to extract the pinion and the bearings. Remove the second pinion.



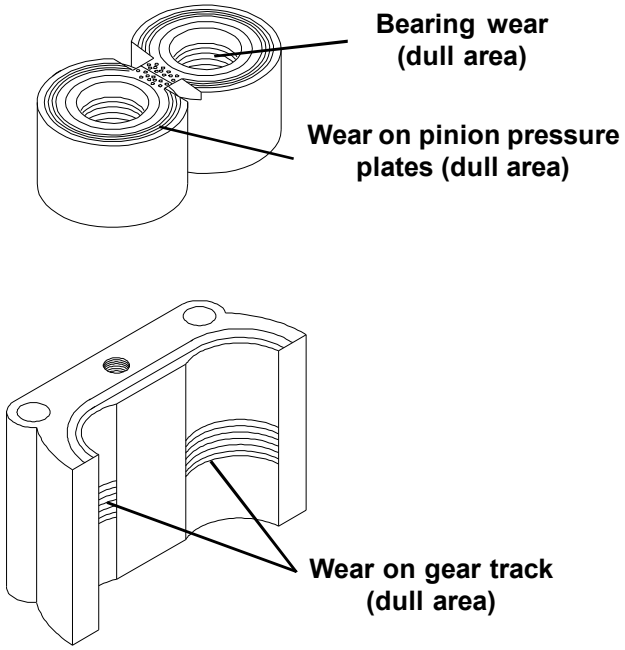
4- Turn the pump body to remove the flange and the second bearing.



A thorough inspection of all pump components allows, depending on parts wear, to determine operating faults or pollution problems in the hydraulic circuit.

Hydraulic circuit pollution

- Abrasive wear caused by abrasive particles.



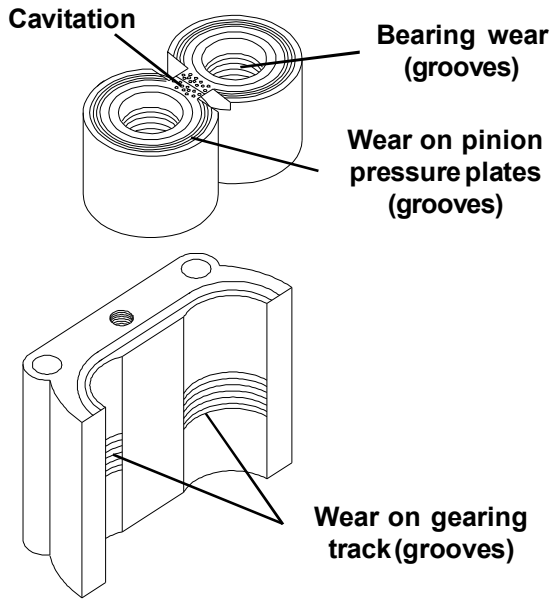
Abrasive wear results in a gradual reduction of the power and speed of the hydraulic system.
Fine particles may enter the circuit:

• During reservoir filling (clean the area around the filling neck before opening the cap. Use clean containers and funnels during filling procedure).

• Through worn seals, particularly on dirty and poorly maintained material.

• During maintenance procedures if components are not capped after hydraulic lines disconnection.

- Abrasive wear caused by metallic particles.
Metal particle wear results in a fairly sudden degradation of the performances of the pump. Metal particles result generally from worn components or from an abnormal wear of the hydraulic circuit : the component must be identified and replaced. All the hydraulic components must be removed and cleaned. The hydraulic circuit must be drained out and flushed and the filters replaced.



Track grooved on suction side = overpressure

- Aeration or cavitation.

Cavitation and aeration act alike in the system.

Aeration occurs when air mixes with the oil. Air may enter the system through a small suction leak or by agitation of the oil in the reservoir. Agitation occurs when the oil returns to the reservoir above the oil surface. This may occurs when the oil level is too low. Cavitation is the formation and collapse of vapour bubbles in the oil. This usually results from a restricted pump suction. Cavitation occurs more readily when the oil is cold.

Aeration and cavitation erode and pit the pressure plates and pump housing.

A pump which is either cavitating or operating on aerated fluid is usually noisy and the system operates in a spongy or jerky manner.

If erosion on the suction side of the pump is evident on the gear tracks, the cause is either air bubbles in the oil or a restricted suction.

- Lack of oil.

When a failure is due to lack of oil, deteriorations are usually rapid. This type of failure may occur if:

- the oil level is low in the reservoir, or
- there is an air leak in the suction line.

- Excessive heat.

Excessive heat will harden the seals.

Excessive heat may be caused by a pressure relief valve set too low, in which case, the machine will be slow.

- Oil pressure too high.

There are two possible causes for overpressure :

- the pressure relief valve fails to function, producing an extreme surge and immediate failure.
- The pressure relief valve is set too high, resulting in repeated pressure peaks. Pump damage is very similar in both cases.

- Incorrect assembly.

This type of failure is self explanatory : components are faulty, or parts have not been assembled correctly.

Pinching of the O-ring will occur if it is not seated properly in its groove. If the O-ring has been seated incorrectly, the surface of the housing will show a depressed area (especially if the part is made of aluminium).

5- Remove the seals.

NOTE

Align the seals in the order they were removed, mark their position and shape to facilitate assembly.

6- Clean the pump components with an appropriate solvent and dry with compressed air. Replace the seals.
If components are damaged, replace the pump.

⚠ CAUTION

Avoid scratching the grooves and gland surfaces.

⚠ CAUTION

Inspect each groove before assembly. Parts must be free from dust and burrs. Grooves and gland surfaces must be in good condition. Worn or damaged parts must be replaced. Do not stretch seals during their assembly. Lubricate seals and gland surfaces with clean hydraulic oil before assembly.

7- Assemble the pump in the reverse order from disassembly.

Bolt torque value (Rep. 1) = 40 to 47 N.m
Bolt torque value (Rep. 2) = 12 to 16 N.m

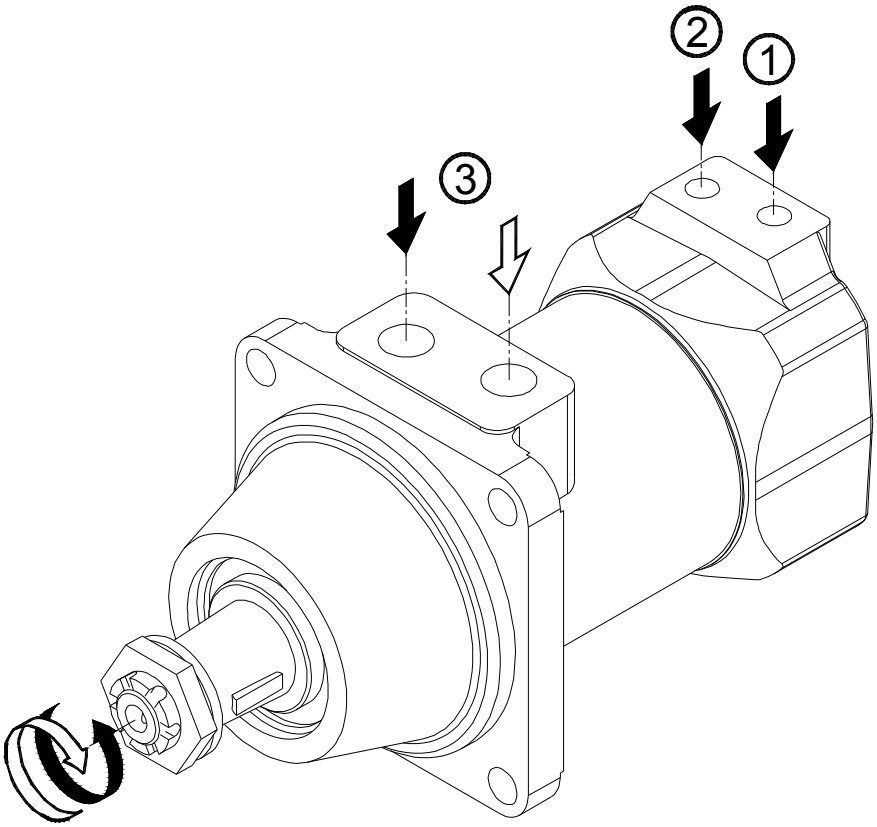
⚠ CAUTION

Respect scrupulously the bolts torque value (Rep. 1) and (Rep. 2). Incorrect torquing will affect the performance of the pump.

⚠ CAUTION

After pump installation, operate the work platform to bleed the air from the hydraulic circuit and check the oil level in the main reservoir (machine fully lowered). Check the good working order of all the control panels.

5.7. Wheel motors



Orbital motors with brakes.

(1) : Drain port.
(2) : Brake pilot port.
(3) : Motor supply port.

Technical characteristics:

Motor :
- cu.cm/rev : 251,5 cm³/t
- Max. operating pressure: 25 MPa (250 bar).

Frein :
- Complete brake release pressure: 2,47 MPa (24,7 bar).

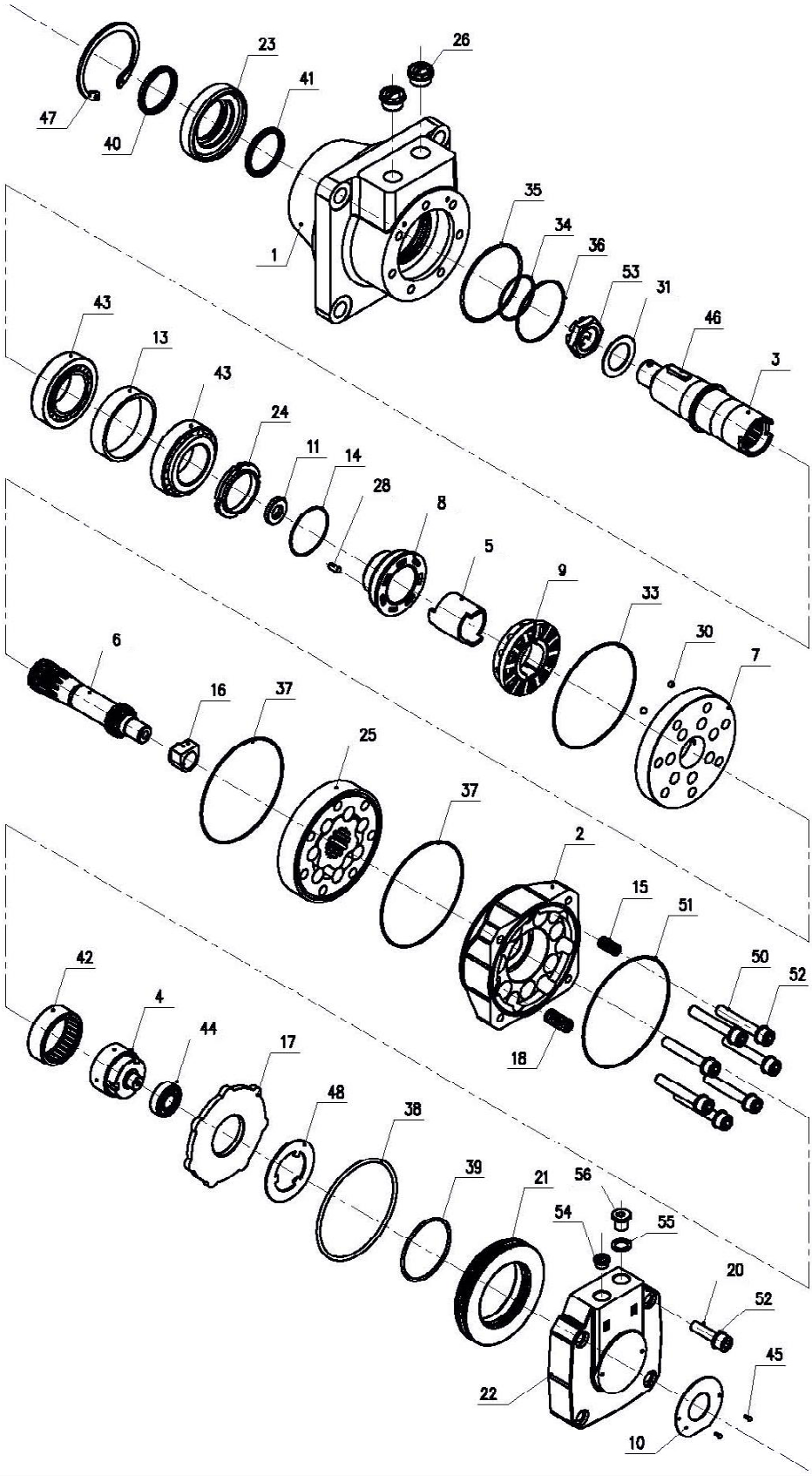
The integrated brakes are used to keep the machine stopped in normal operation, not to slow the machine down.

⚠ CAUTION

In case dynamic braking (counterbalance valves) fails, this function will be provided by the integrated brakes : the machine must be removed from service, the dynamic braking system repaired AND the efficiency of the motor brakes checked before the machine is returned to service.

Preliminary remarks:

- Disassembly of the motor entails replacement of the seals.
- Competences and specific tooling are required: If any doubt, contact Product Support (see p11).



5.7.1. Disassembly

- Scribe a line over the motor body to respect the same parts alignment during assembly.
- Note the relative positions using marks, drawings or photos of the output shaft, drive shaft, rotor and valve plate. Misalignement will affect motor performances.
- Mark the positions of the brake springs (more sockets than springs).

5.7.2. Assembly

Output shaft

- Nut torque value (24) : 60 N.m.
  Locking by deformation of the nut in the shaft notches.
- Install the cover (23) with its seal (41), while protecting the seal lips with a socket.
- Turn the output shaft in such a way that its position corresponds to the position marked during disassembly.

Timing valve

- Insert the valve plate (8) with its split pin (28) in the motor body using a plastic mallet.
  The spring washer must be slightly pre-stressed.
- Hold the balls (30) and the seal (33) in their housing using grease.

Motor

- Insert the drive shaft (6) then the stator / rotor assembly (25) ensuring the alignment noted previously is respected.
  Hold the seal (37) with grease.
- Press the bearing (42) inside the brake body (2).
- Install the brake body on the motor - Torque value of the screws (50) : 34N.m.

Brake

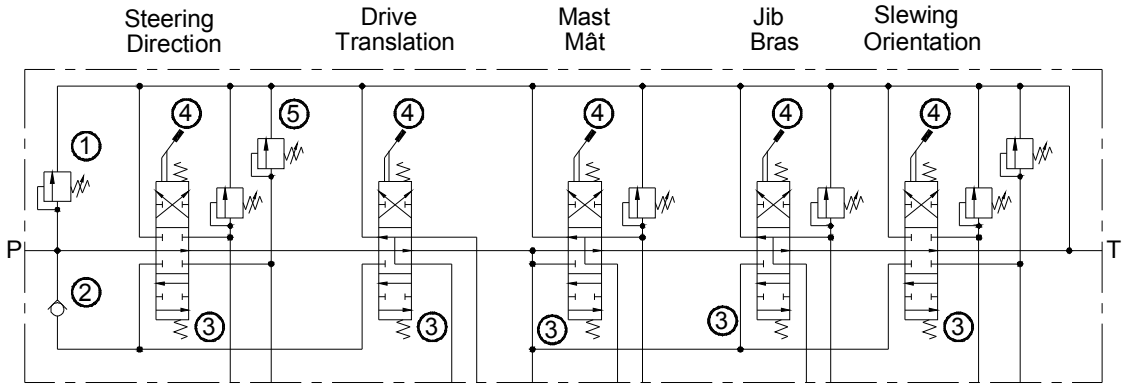
- Grease the seals (38) and (39) during assembly.
- Hold the part (16) in place using grease.
- The bearing (44) should be installed with "Loctite 638 ®" on the outer ring.
  Apply "Loctite 638 ®" on degreased parts.
- Install the brake piston (21) in the brake cover (22) using a manual press.

⚠ CAUTION

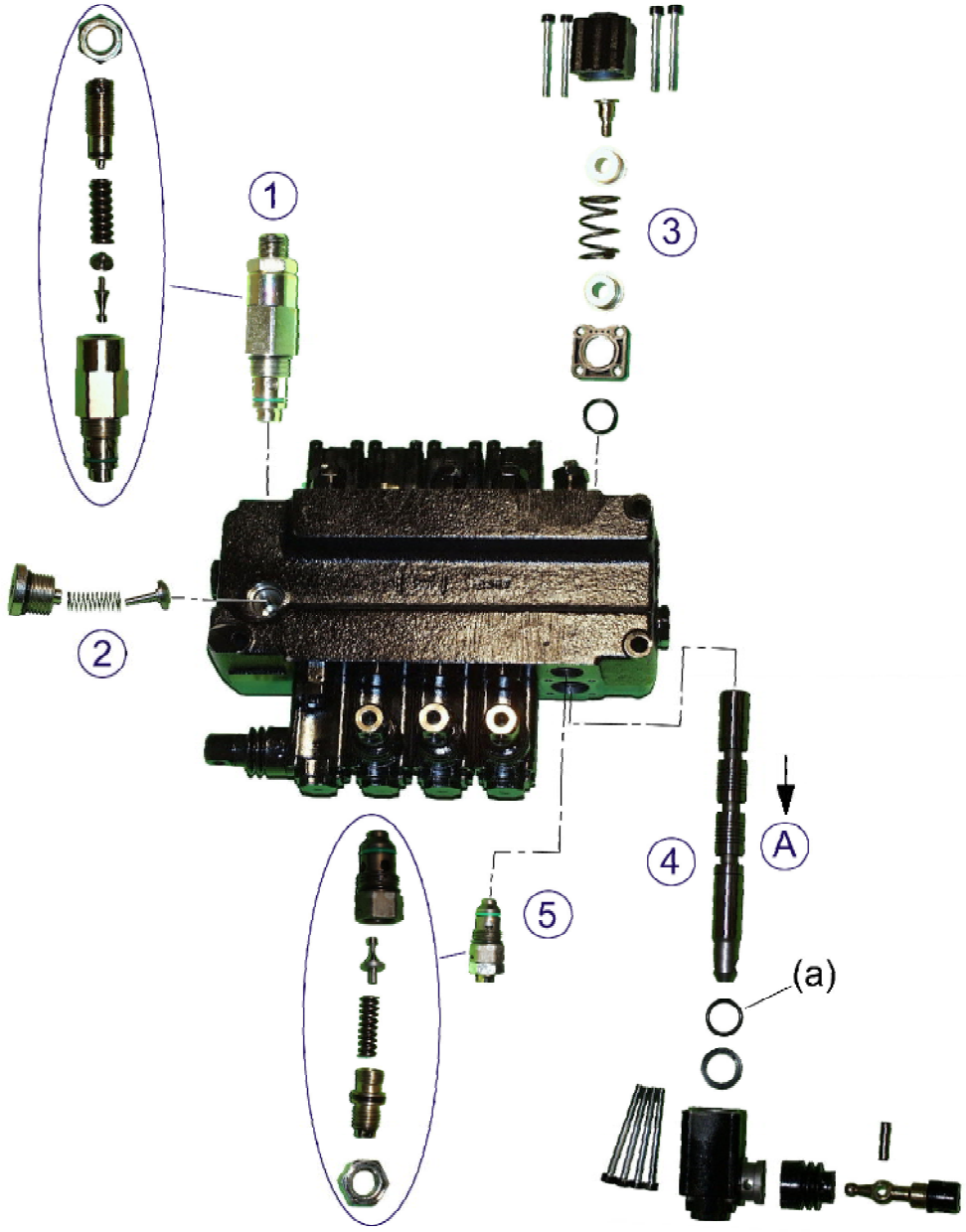
Interchanging the brake discs will cause malfunctions of the motor and of the brake.

5.8. Upper control valve

Schema



Exploded view



Indications for maintenance on the control valve.

- Torque value for control valve attachment bolts (M8) : 13 N.m.

(1) - Hydraulic circuit main pressure relief valve.

- Torque value: 80 N.m.
- Lubricate seals and surfaces before assembly (hydraulic oil).

(2) - Check valve.

- Torque value: 8,5 N.m.
- Do not force during assembly and take special care when guiding the valve.

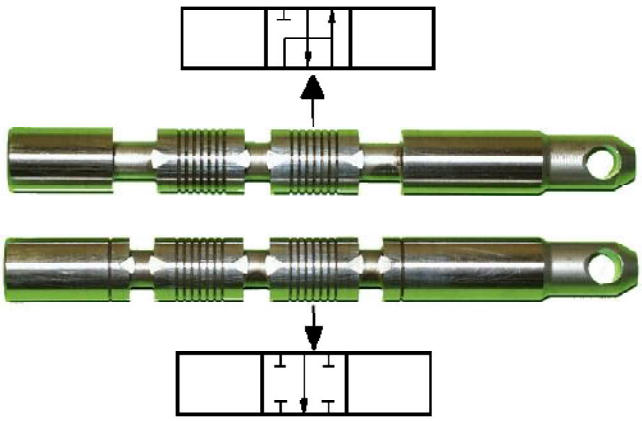
(3) - Spool return system.

- Torque value (cover screw) : 3,5 N.m.
- Grease spring and pins on assembly.

(4) - Spool and its manoeuvre system.

(→A) : Spool extraction direction.
Install and remove the spool without the seal **(a)** to prevent damages to the seal.

- Torque value: 3,5 N.m.
- Grease the ball joint of the manoeuvre system during assembly.



(5) - Pressure relief valve.

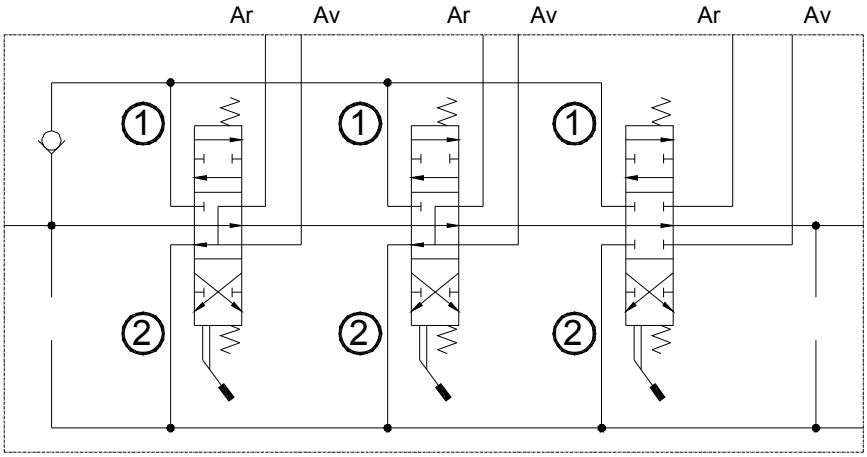
⚠ CAUTION

3 different adjustment ranges:
- **16 MPa**
- **14 MPa**
- **8-12 MPa**

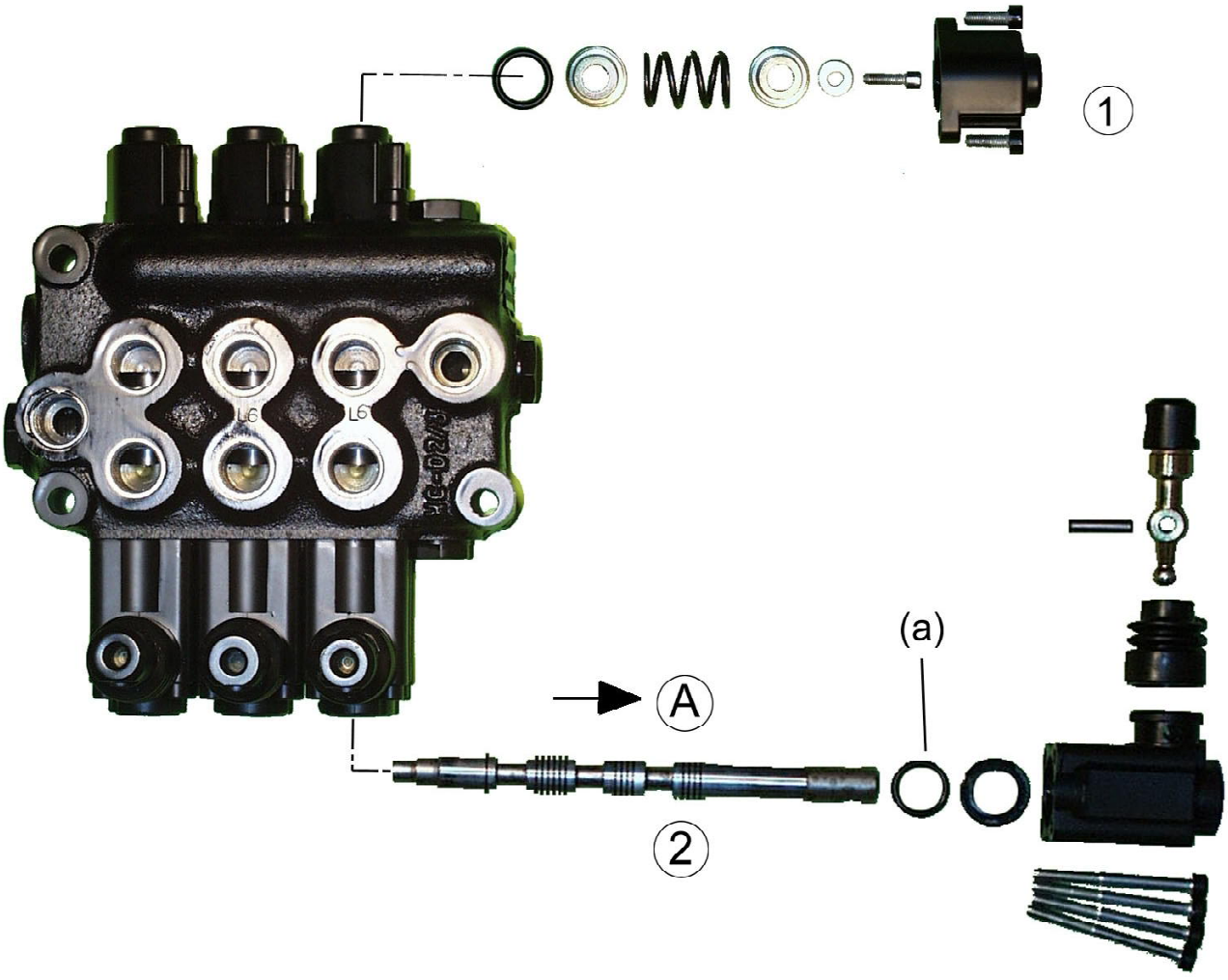
- Lubricate seals and surfaces before assembly (hydraulic oil).

5.9. Lower control valve

Schema



Exploded view



Indications for maintenance on the control valve.

- Torque value of the control valve attachment bolts (M8) : 13 N.m.

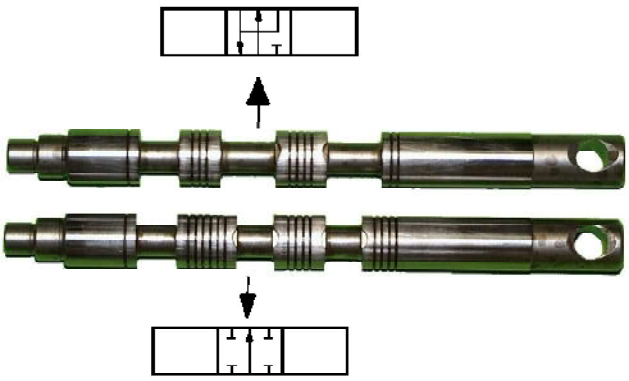
(1) - Spool return system.

- Torque value (cover attachment screw) : 3,5 N.m.
- Grease spring and cup during assembly.

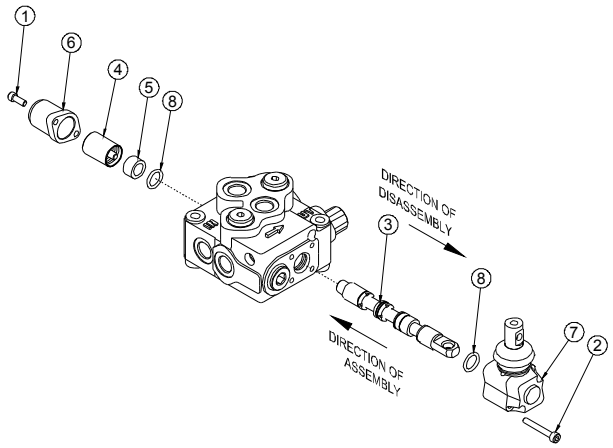
(2) - Spool and its manoeuvre system.

(→A) : Spool extraction direction.
Install and remove the spool without seal **(a)** to prevent damage to the seal.

- Torque value: 3,5 N.m.
- Grease the ball joint of the manoeuvre system during assembly.



5.10. Release control valve

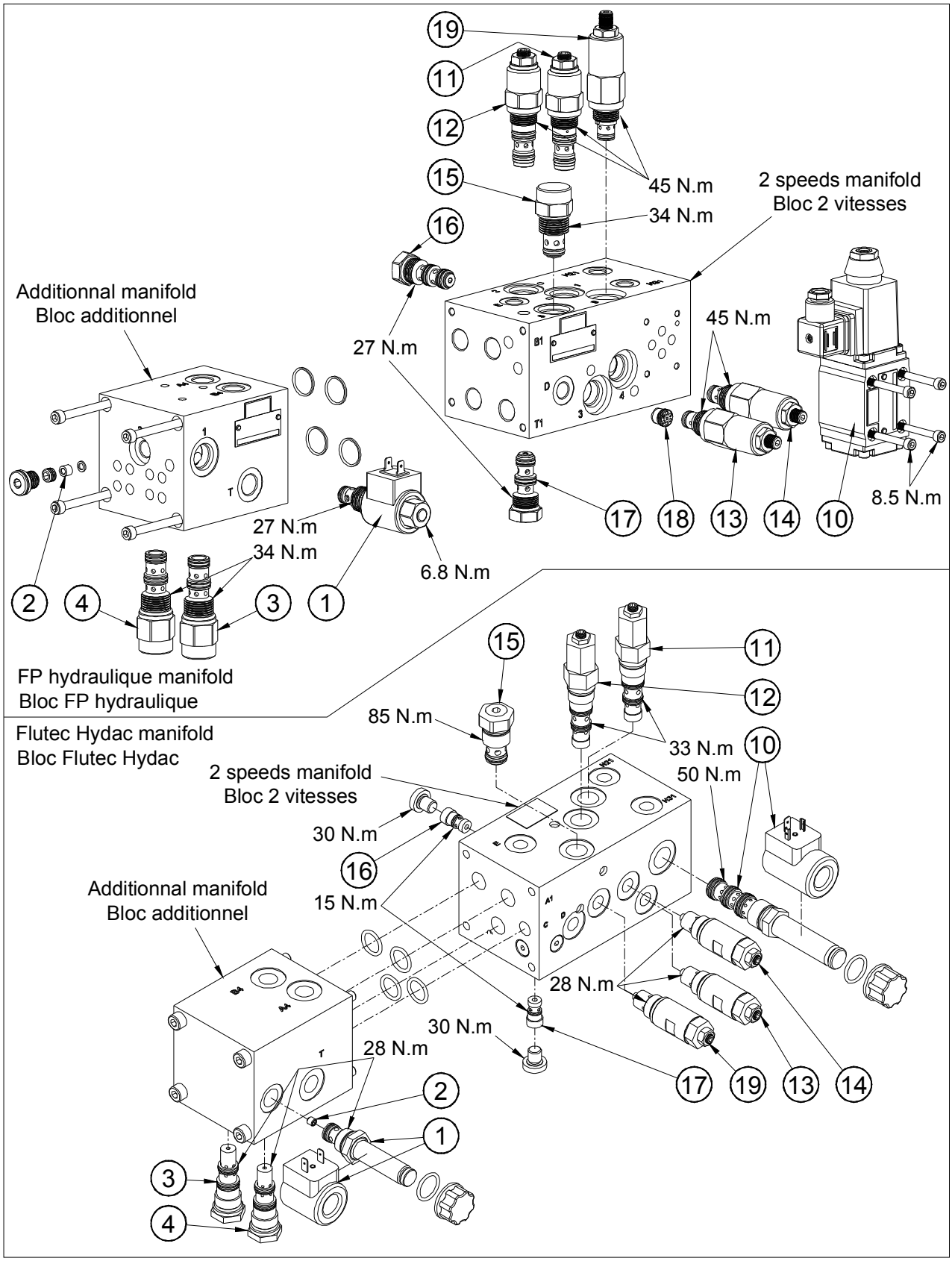


1- Rear cover attachment bolt
2- Front cover attachment bolt
3- Spool
4- Bush
5- Spacer
6- Rear cover
7- Front cover
8- O-ring

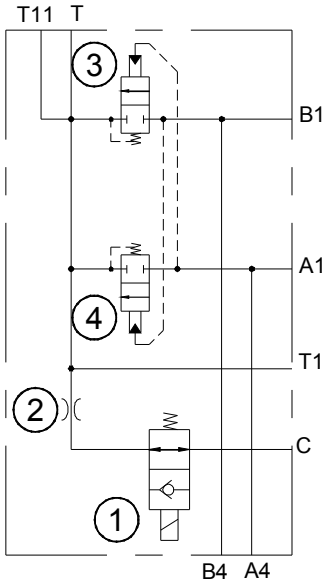
- Respect the directions of assembly and disassembly for the spool to prevent damage to the seals.
- Grease the bushing and joints during assembly.
- Lubricate seals and bearing surfaces during assembly (hydraulic oil).

5.11. Drive manifold

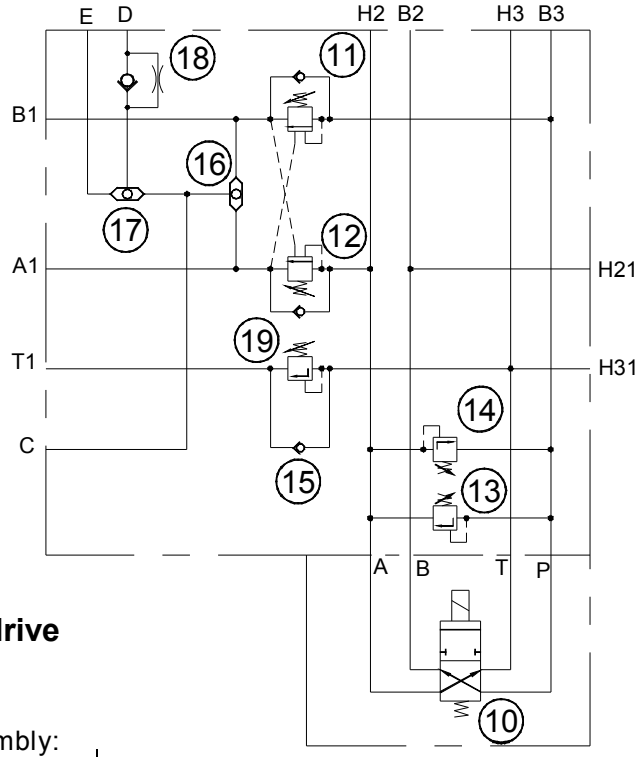
Exploded view and schema



Additionnal manifold
Bloc additionnel



2 speeds manifold
Bloc 2 vitesses



Indications for maintenance on the drive manifold.

Lubricate seals and surfaces during assembly: Hydraulic oil or grease "Parker O' Lub" recommended.

2-speed manifold :

(10) : Control valve 4/2 with electrical controls.
Management of the motors supply mode: series or parallel (mode by default).

(11) (12) : Counterbalance valves.
Ensure the machine's dynamic braking.
(11) : Braking for reverse drive.
(12) : Braking for forward drive.

(13) (14) : Pressure relief valves.
Motor protection against pressure peaks (in particular during sudden reversal of the drive direction).

(15) : Check valve.
Supply to the motor on the outside of the bend in the series motor configuration (3rd gear active).
- Works in :
forward drive left steering,
reverse drive right steering.

(16) : Circuit selector.
Supply to the brakes.
Substraction of flow to obtain "low speed" (see "additionnal manifold").

(17) : Circuit selector.
Supply to the brake.

(18) : Jet valve.
Brake management.
Free flow : immediate supply to release the brakes at beginning of drive movement.
Calibrated flow : temporisation of brake action when drive movement stops (to enable dynamic braking by the counterbalance valves).
Specific tooling: Ref. 990011.
Ensure the O ring is present on the shoulder.

(19) : Pressure relief valve.
Dumping of excess flow to the supply of the motor on the outside of the bent in configuration "series moteurs" (3rd gear active).
Limits the motor torque in reverse drive.

Additionnal manifold :

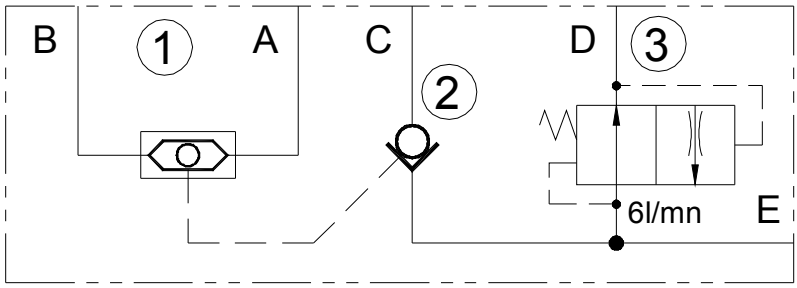
(1) : Control valve 2/2 with electrical controls.
Management of low speed by dumping the flow.

(2) : Jet.
Limitation of flow dumping.
Tools :
- Bloc FP hydraulique :
Allen key 4mm (jet holding screw).
Screw M5x30 (to screw in the jet for its extraction).
- Bloc Flutec Hydac : Allen key 3mm.

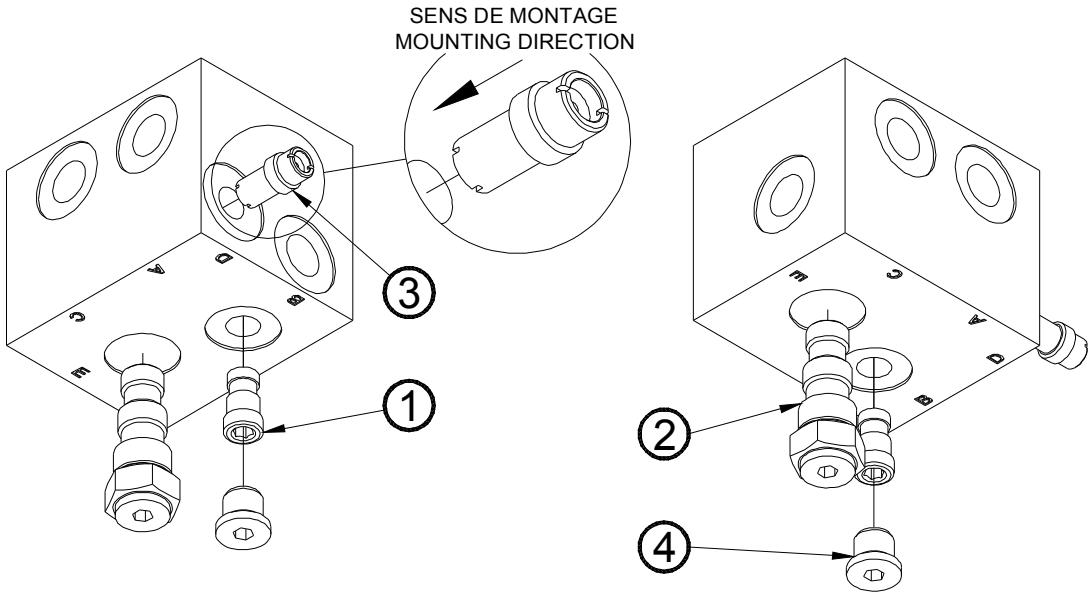
(3) (4) : Control valves 2/2 with hydraulic controls.
Diversion of the motor return flow: direct return to the tank without going through the upper control valve.
(3) : Return forward drive.
(4) : Return reverse drive.

5.12. Upper auxillary manifold

Schema :



Exploded view :



Functions :

- **(1)** + **(2)** : Disables structure movements during drive movements.
- **(3)** : Limitation of the jib elevation speed.

Description :

(1) : Circuit selector.
Detection of drive movements.
- Torque value 27 N.m.

(2) : Pilot valve.
Dumping of flow resulting from the "drive and steering" part from the upper control valve.
- Torque value 37 N.m.

(3) : Flow regulator.
Regulation of the flow taken from the jib cylinder supply.
- Torque value 4 N.m.

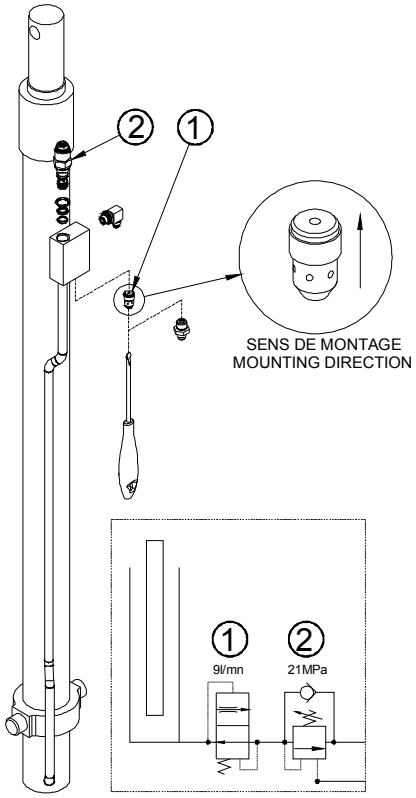
(4) : Plug.
- Torque value 27 N.m.

⚠ CAUTION

During assembly, check the presence and correct seating of the seal at the and of the selector.

5.13. Cylinder supply manifold

5.13.1 Mast cylinder



(1) : *Pressure compensated flow regulator.*

Ensures a constant lowering speed whatever the load in the work platform.

- Flow: 9 l/mn

⚠ CAUTION

Respect the assembly direction of the flow regulator. Use a screwdriver of appropriate dimension to prevent damage to the regulator recess.

(2) : *Counterbalance valve.*

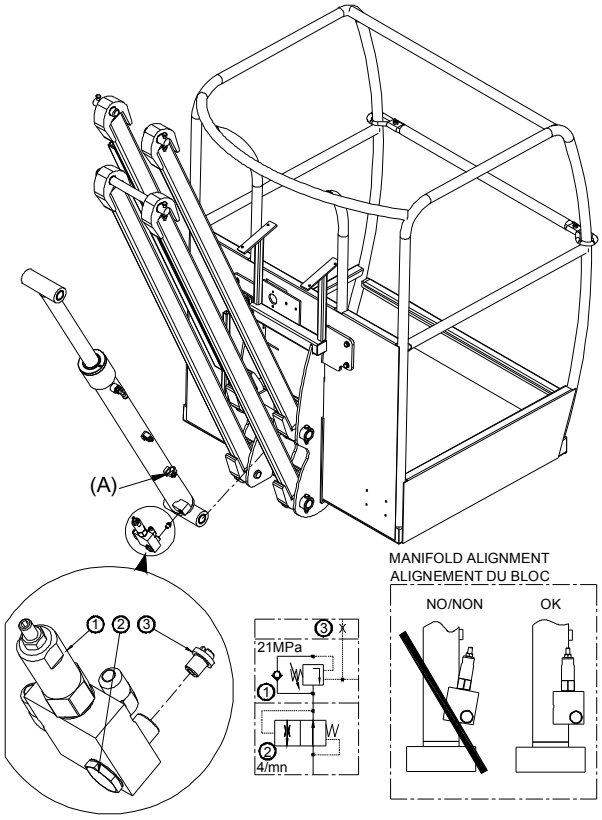
Load holding in the event of hose failure.
Pressure limitation in the cylinder barrel in case of overload or oil dilatation.

- Pilot ratio: 10:1.
- Setting: 21 MPa (210 bar) at 4 l/mn (factory setting).
- Torque value 45 N.m.

NOTE

The locknut must be tight to prevent any external leak.

5.13.2 Jib cylinder



(1) : *Counterbalance valve.*

Load holding in the event of hose failure.
Pressure limitation in the cylinder barrel in case of overload or oil dilatation.

- Setting: 15 MPa (150 bar) at 4 l/mn (factory setting).
- Torque value 30 N.m.

(2) : *Banjo bolt with built-in flow regulator.*

Regulation of jib lowering speed.
Link to cylinder.

- Torque value 45 N.m.

(3) : *Flow control valve.*

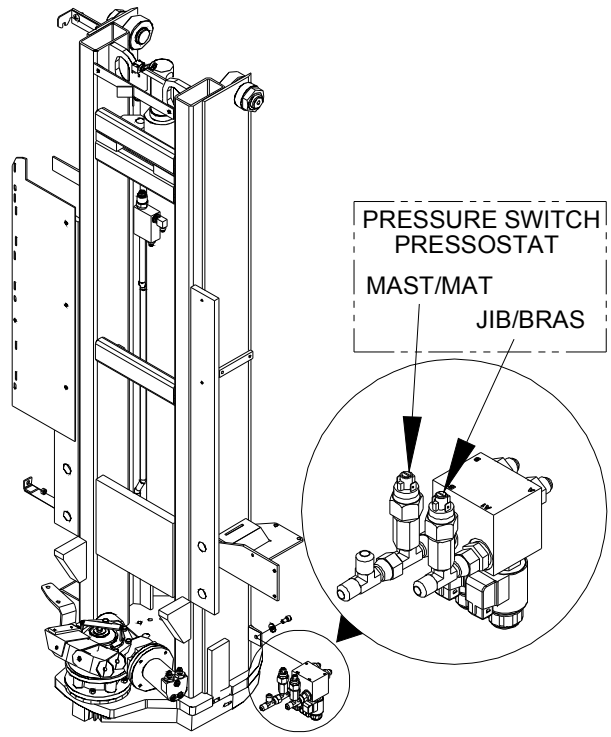
⚠ CAUTION

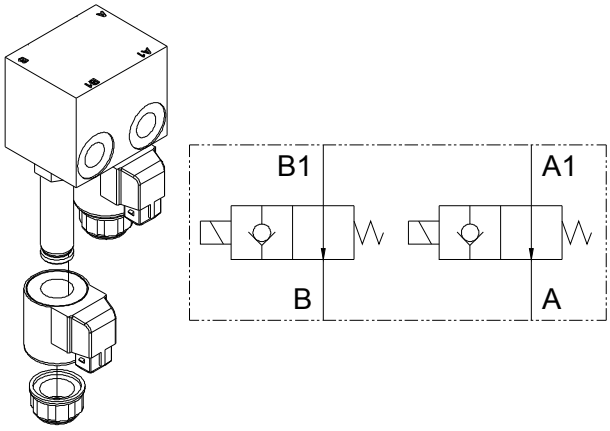
Check the presenceof the flow control valve during assembly.
It must be inserted in the banjo bolt.

⚠ DANGER

Respect the alignment of the supply manifold with the cylinder. Install the hose fixation clamp (A).

5.13.3 Safety manifold





Manifold comprising of 2 control valves 2/2 with electrical controls.
Dumping of pilot lines for mast and jib lowering.
Coils supplied by slack chain sensors.
Torque value:

- Cartridge: 27 N.m.
- Coil nut: 4.5 N.m.

⚠ CAUTION

Coils supplied permanently in normal opération. Wait for 10 minutes, key selector on "O" before working on this manifold.

CHAPTER 6

CONTROLS - MAINTENANCE

⚠ CAUTION

Control and maintenance intervals must be respected to ensure safe operation of the work platform. The work platform must not be used if it is not operating PERFECTLY: it must be repaired and checked by a qualified and trained personnel before the machine is returned to service.

NOTE

If the work platform has been left idle for a long period of time, all the control, cleaning and lubrication procedures described below must be performed before the work platform is used again.

(1) A qualifed technician trained to the work platform maintenance is required.
(2) Special case : case where frequency has be be increased.
(OP) Described in the "Operator's and safety manual".

Paragraph	Description of control points and service or maintenance operations	Technician (1)	Intervals (hours)	Particular case (2)	Observations
(OP)	Presence of the Operator's and safety handbook.		↑ Before each operation ↓		
(OP)	Presence of the operating and safety instructions decals.				
(OP)	Damaged, loose or missing parts.				
(OP)	Hydraulic oil level (main reservoir).	(▪)			
(OP)	Good working order of control panels.				
(OP)	Good working order of Mast sensor.				
(OP)	Good working order of breakdown control panel.				
(OP)	Tilt indicator. (Operation)				
(OP)	Test slack chain detection.				
(OP)	Electrolyte level in the batteries	(▪)			After the charge
5.1.9	Lubrication of telescopic mast profiled sections.	▪	125	▪	- After each cleaning. - More often if the platform is used or stored in a very dusty or agressive environment.
5.1.9	Lifting chains lubrication.	▪	125	▪	More often if the platform is used or stored in a very dusty or agressive environment
5.1.2	Battery cleaning	(▪)	125		
5.1.8	Control of wheel nut torque.	▪	125	▪	After the first 50 hours of operation. More often if the platform is frequently transported by road or rail.

4.3	Tilt indicator (setting verification).	(▪)	125	▪	
4.4	Incline indicator (setting verification).	(▪)	125	▪	
(OP)	Control of motor brush in the main power unit.		125	▪	After the machine is transported by road or rail.
(OP)	Cleaning of the main power unit (ventilation holes).		125	▪	More often if the platform is used or stored in a very dusty or agressive environment.
(OP)	Control of wear on steering bracket thrust bearings.		125	▪	
(OP)	Control of wear on bushes on jib and steering system.		125	▪	
5.1.9	Wheel hub and steering pivot greasing.	▪	250	▪	After each cleaning. More often if the platform is used or stored in a very dusty or agressive environment.
(OP)	Replacement of hydraulic filters (pressure filter and return filter).	▪	250	▪	After the first 50 hours of operation. After the first 50 hours of operation following an oil change.
5.1.9	Turntable lubrication.	▪	250	▪	After each cleaning. More often if the platform is used or stored in a very dusty or agressive environment.
(OP)	Battery electrolyte acidity control. Verification of voltage in battery cells.	▪	250	▪	More often if the platform is used or stored in a very dusty or agressive environment.
4.2	Mast alignment control and adjustment.	▪	500	▪	Adjustment only if necessary.
5.4	Verification of torque for turntable bolts.	▪	500	▪	After the first 100 hours of operation. More often if the platform is frequently transported by road or rail.
(OP) + 4.2	Control of lifting chains wear.	▪	500	▪	immediatly if the platform was overloaded (Max. load authorized in platform exceeded). More often if the platform is used or stored in a very dusty or agressive environment.
4.8	Setting control of pressure relief valves.	▪	500	▪	
5.1.9	Hydraulic oil change.	▪	1000		At least every 2 years.
	Control of the work platform by an approved body.	▪	-	▪	In accordance with regulations in force.
	Pressure in the extinguisher (optional equipment).			▪	In accordance with regulations in force.

NOTES